RF TEST REPORT

Test item	:	Notebook PC
Model No.	:	NP900X3F, NP900X3E
Order No.	:	DEMC1303-00944, DEMC1303-00945
Date of receipt	:	2013-03-11
Test duration	:	2013-04-01 ~ 2013-05-02
Date of issue	:	2013-05-03
Use of report	:	FCC& IC Original Grant

Applicant : Samsung Electronics Co Ltd
19 Chapin Rd., Building D Pine Brook, United States, NJ 07058

Test laboratory : Digital EMC Co., Ltd.
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, 449-080, Korea

Test specification	:	FCC Part 15.407 Subpart E & RSS-210 Issue 8 KDB 789033 v01r03
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

Tested by:	Witnessed by:	Reviewed by:
Engineer HyunSuSon	N/A	Technical Director Harvey sung

Test Report Version

Test Report No.	Date	Description
DRTFCC1305-0432	May. 03, 2013	Initial issue

CONTENTS

1.EUT information

1.1 EUT description

FCC Equipment Class	Unlicensed National Information Infrastructure (UNII)
Product	Notebook PC
Model Name	NP900X3F
Add Model Name	NP900X3E
Equipment serial no.	Identical prototype
Frequency Range	802.11a/n(20MHz) Band I: 5180 ~ 5240MHz(4 channels) Band II: 5260 ~ 5320MHz(4 channels) Band III: 5500 ~ 5700MHz(8 channels) 802.11n(40MHz) : Band I: 5190 ~ 5230MHz(2 channels) Band II: 5270 ~ 5310MHz(2 channels) Band III: 5510 ~ 5670MHz(3 channels)
Modulation type	802.11a/n(HT20/n(HT40) : OFDM
Data rate	802.11a: 6 ~ 54 Mbps 802.11n(20MHz): MCS 0 ~ 15 802.11n(40MHz): MCS 0 ~ 15
Antenna Specification	Internal Antenna(2TX 2RX) Max Peak gain information Band I: Chain 0= 4.22dBi& Chain 1 =0.54dBi Band II: Chain 0 =1.70dBi & Chain 1 =3.13dBi Band III: Chain 0 =3.53dBi& Chain 1 =3.48dBi
Power Supply	DC 7.5 V

1.2 Ancillary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

2. Information about test items

2.1 Test mode

5GHz Band	Mode	Data Rate
Band I	802.11a	6Mbps
	802.11n(20MHz)	MCS8
	802.11n(40MHz)	MCS8
Band II	802.11a	6Mbps
	802.11n(20MHz)	MCS8
	802.11n(40MHz)	MCS8
Band III	802.11a	6Mbps
	802.11n(20MHz)	MCS8
	802.11n(40MHz)	MCS8

For all test items, the low, middle and high channels of the modes were tested with above worst case data rate.

2.2Tested Channel Information

5GHz Band	802.11a/n(20MHz)		802.11n(40MHz)	
	Channel	Frequency [MHz]	Channel	Frequency [MHz]
Band I	36	5180	38	5190
	44	5220	-	-
	48	5240	46	5230
Band II	52	5260	54	5270
	56	5280	-	-
	64	5320	62	5310
Band III	100	5500	102	5510
	116	5580	110	5550
	140	5700	134	5670

▪ Supported Antenna Configuration

Band	Mode	SingleTransmitting		Multiple Transmitting (2 TX / 2 RX)
		Chain 0	Chain 1	
5GHz	802.11a	O	X	X
	802.11n(20MHz)MCS 0 ~ 7	O	X	X
	802.11n(20MHz)MCS 8 ~ 15	O	O	O
	802.11n(40MHz)MCS 0 ~ 7	O	X	X
	802.11n(40MHz)MCS 8 ~ 15	O	O	O

2.3 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

2.4 Tested environment

Temperature	:	21 ~ 24°C
Relative humidity content	:	45 ~ 55 % R.H.
Details of power supply	:	DC 7.5V AC120V 60Hz

2.5 EMI Suppression Device(s) / Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. Test Report

3.1 Summary of tests

FCC Part Section(s)	RSS Section(s)	Parameter	Limit	Test Condition	Status Note 1
I. Transmitter Mode (TX)					
15.407(a)	N/A	Emission Bandwidth (26 dB Bandwidth)	N/A	Conducted	C
15.407(a)	RSS-210 [A9.2]	Maximum Conducted Output Power	5150 ~ 5250MHz For FCC 50mW or<4 + 10log$_{10}$(B) dBm, whichever power is less. 5150 ~ 5250MHz For IC 200mWor <10 + 10log$_{10}$(B) dBm, whichever power is less. 5250 ~ 5350MHz For FCC & IC 250mWor <11 + 10log$_{10}$(B) dBm, whichever power is less. 5470 ~ 5725MHz For FCC & IC 250mW or<11 + 10log$_{10}$(B) dBm, whichever power is less.		C
15.407(a)	RSS-210 [A9.2]	Peak Power Spectral Density	5150 ~ 5250MHz For FCC: 4dBm/MHz 5150 ~ 5250MHz For IC: 10dBm/MHz 5250 ~ 5350MHz For FCC & IC: 11dBm/MHz 5470 ~ 5725MHz For FCC & IC: 11dBm/MHz		C
15.407(a)	N/A	Peak Excursion	< 13 dB/MHz maximum difference		C
15.407(g)	N/A	Frequency Stability	N/A		C
-	RSS Gen [4.6.1]	Occupied Bandwidth (99%)	N/A		C
15.407(b)	RSS-210 [A9.2]	Undesirable Emissions	< -27 dBm/MHz EIRP	Radiated	C
15.205 15.209 15.407(b)	RSS-Gen [7.2.5]	General Field Strength Limits(Restricted Bands and RadiatedEmission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		C Note.2
15.407(h)	RSS-210 [A9.3]	Dynamic Frequency Selection	See DFS test report	-	C Note.3
15.207	RSS-Gen [7.2.4]	AC Conducted Emissions	FCC 15.207	AC Line Conducted	C
15.203	RSS-Gen [7.1.2]	Antenna Requirements	FCC 15.203	-	C

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

Note 2: These test items were performed in each axis and the worst case data was reported.

Note 3: For DFS testing, please refer to DFS test report.

3.2 Transmitter requirements

3.2.1 Emission Bandwidth(26 dB Bandwidth)

Test Requirements

The bandwidth at 26 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies. The 26dB bandwidth is used to determine the conducted output power limit.

▣TEST CONFIGURATION

Refer to the APPENDIX I.

▣TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of **KDB789033**.

1. Set resolution bandwidth (RBW) = approximately **1 %** of the EBW
2. Set the video bandwidth **(VBW) >RBW**.
3. Detector = **Peak**.
4. Trace mode = **max hold**.

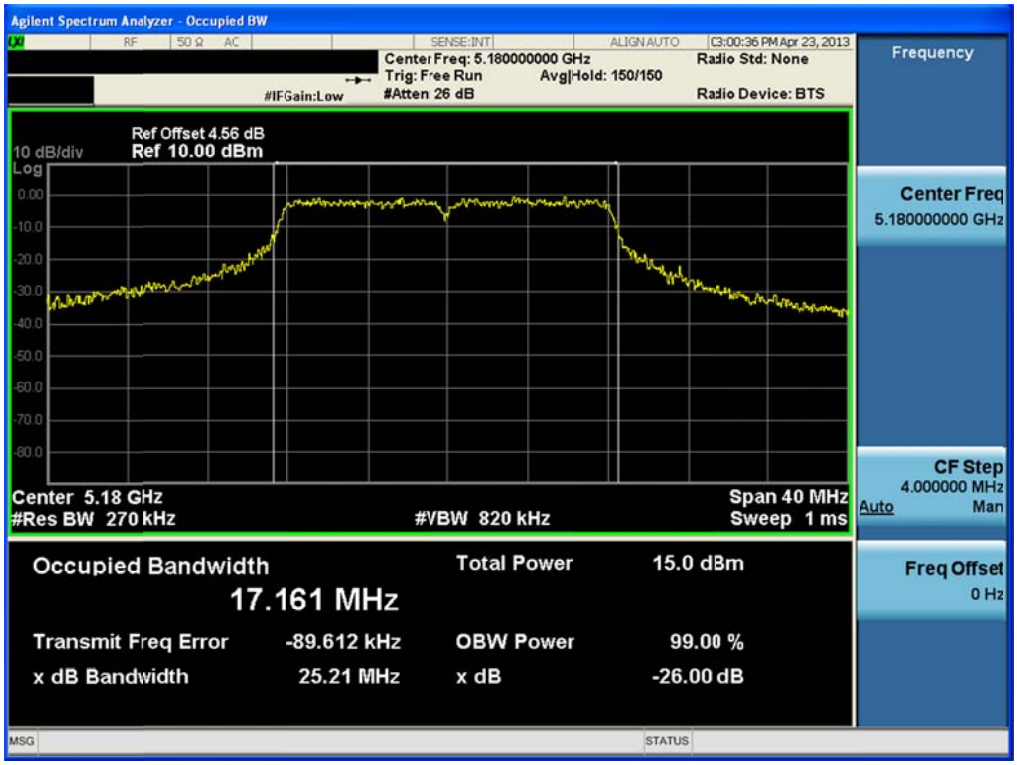
Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

▣TEST RESULTS: Comply

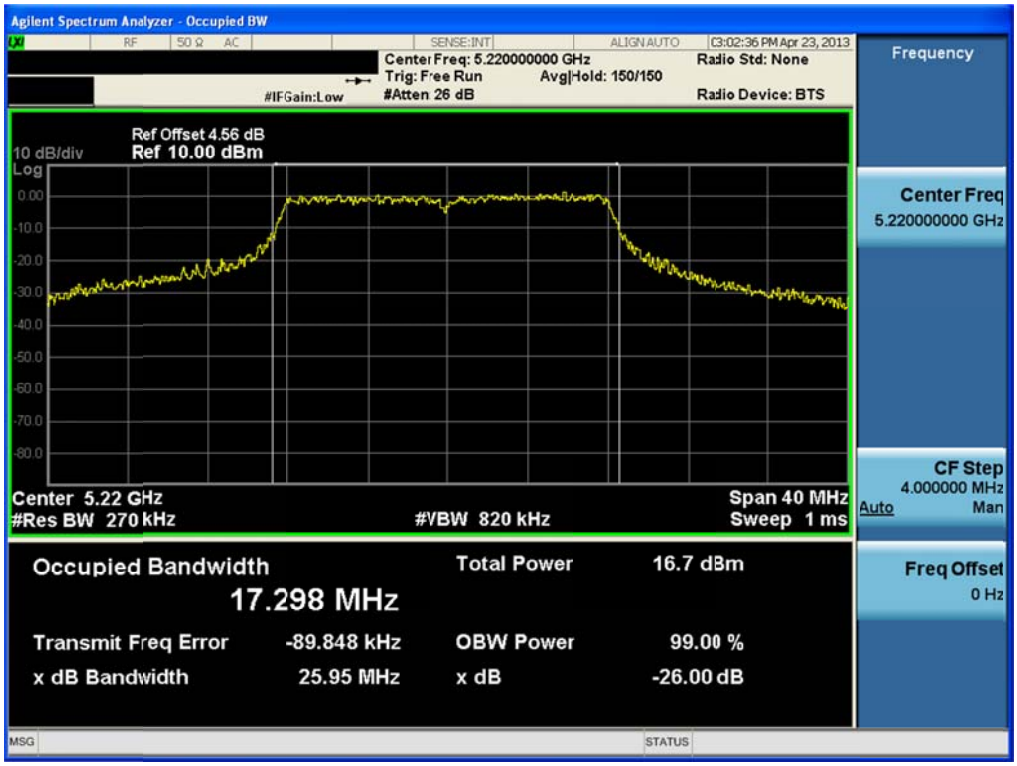
Mode	Band	Channel	Frequency [MHz]	Test Result [MHz]	
				Chain 0	Chain 1
802.11a	Band I	36	5180	25.210	-
		44	5220	25.950	-
		48	5240	26.880	-
	Band II	52	5260	27.720	-
		56	5280	27.490	-
		64	5320	27.150	-
	Band III	100	5500	25.130	-
		116	5580	24.860	-
		140	5700	24.950	-
802.11n (20MHz)	Band I	36	5180	26.100	24.940
		44	5220	24.870	25.340
		48	5240	26.030	25.230
	Band II	52	5260	25.270	25.210
		56	5280	26.060	24.960
		64	5320	24.910	25.770
	Band III	100	5500	24.940	25.180
		116	5580	24.620	25.370
		140	5700	24.310	24.500
802.11n (40MHz)	Band I	38	5190	43.240	43.430
		46	5230	42.990	42.650
	Band II	54	5270	44.610	42.590
		62	5310	43.420	43.090
	Band III	102	5510	42.990	42.720
		110	5550	42.210	42.670
		134	5670	42.440	42.690

▣RESULT PLOTS

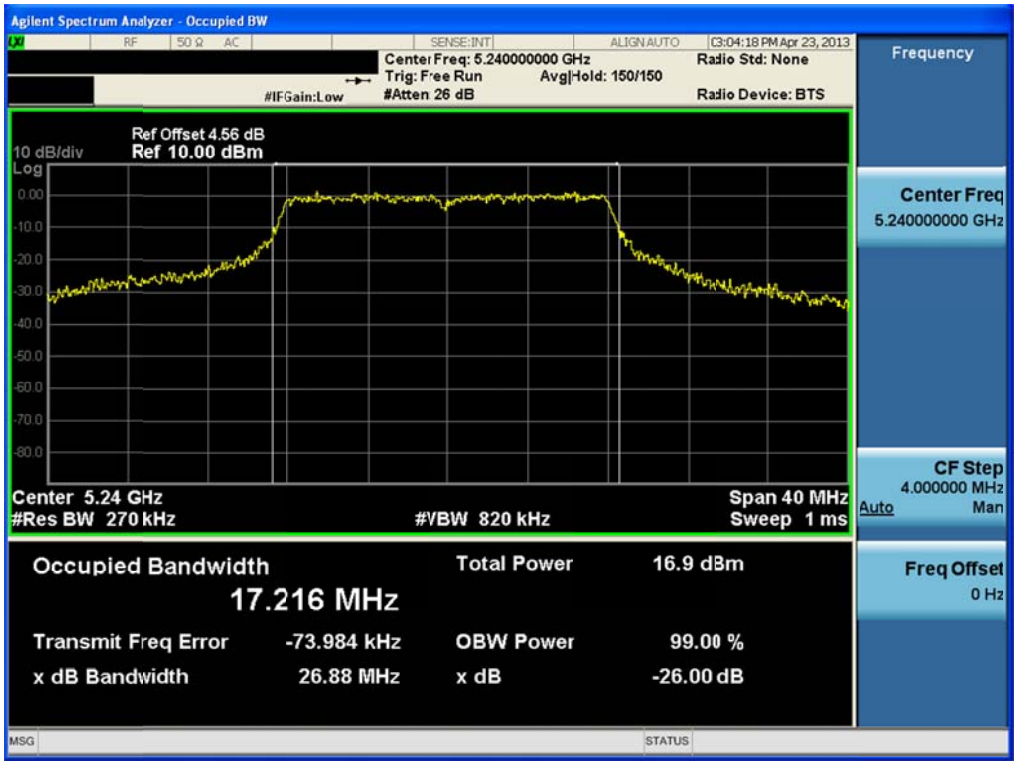
26 dB Bandwidth Test Mode: Chain 0 & 802.11a & Ch.36



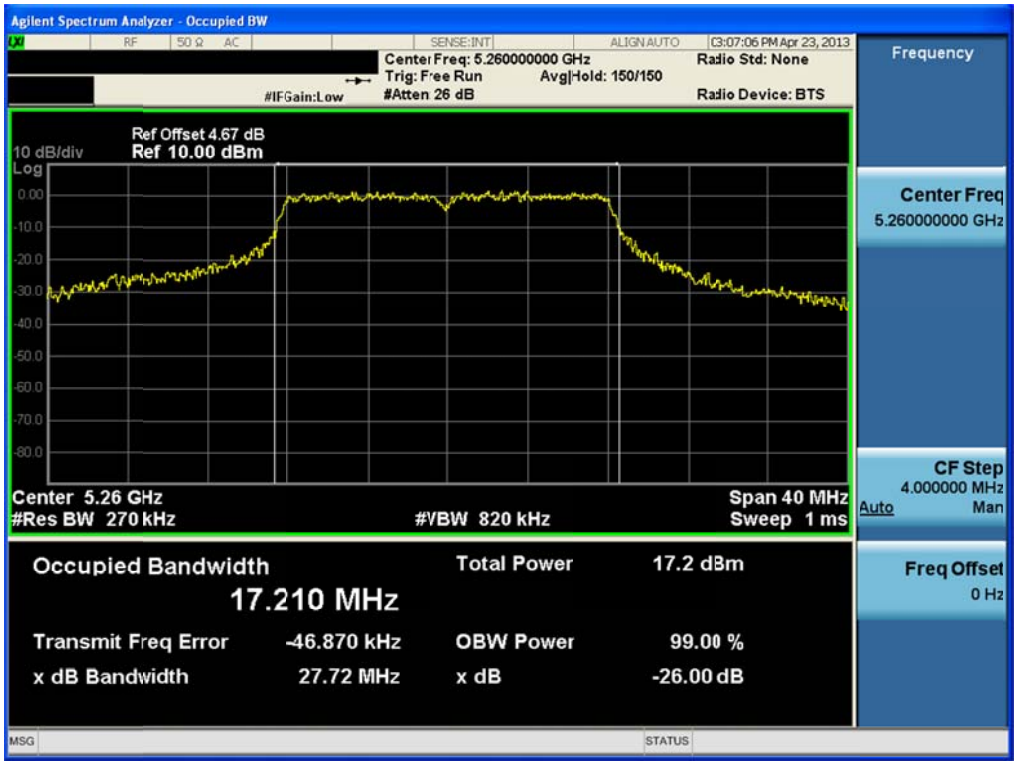
26 dB Bandwidth Test Mode: Chain 0 & 802.11a & Ch.44



26 dB Bandwidth Test Mode: Chain 0 & 802.11a & Ch.48



26 dB Bandwidth Test Mode: Chain 0 & 802.11a & Ch.52



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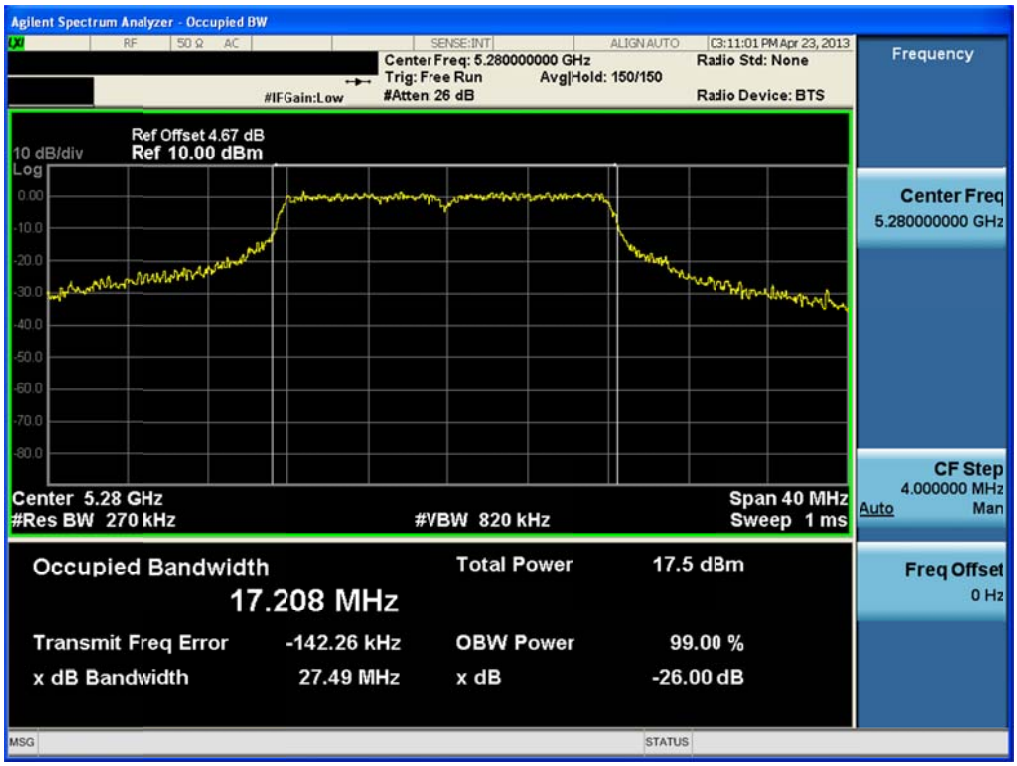

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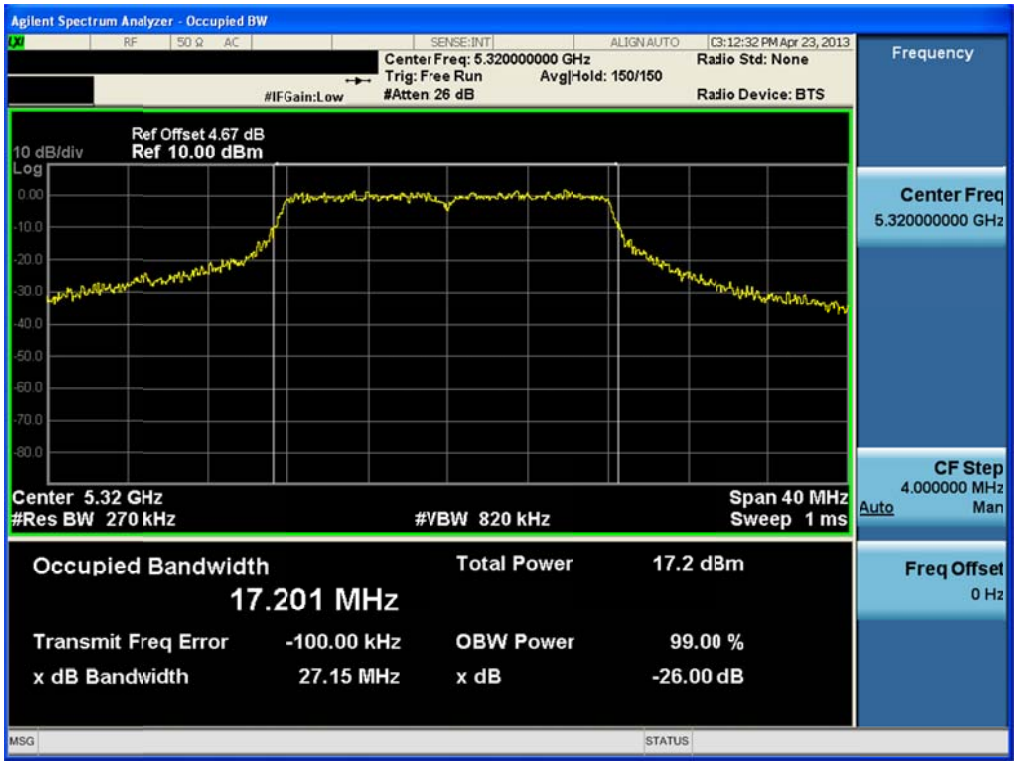

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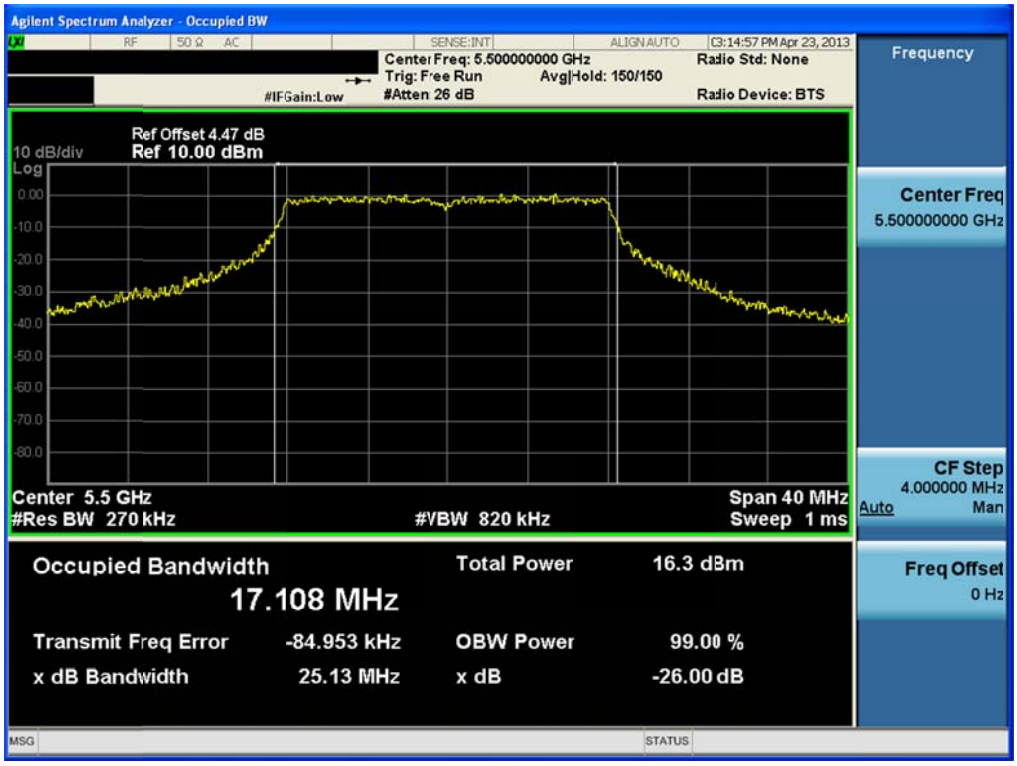
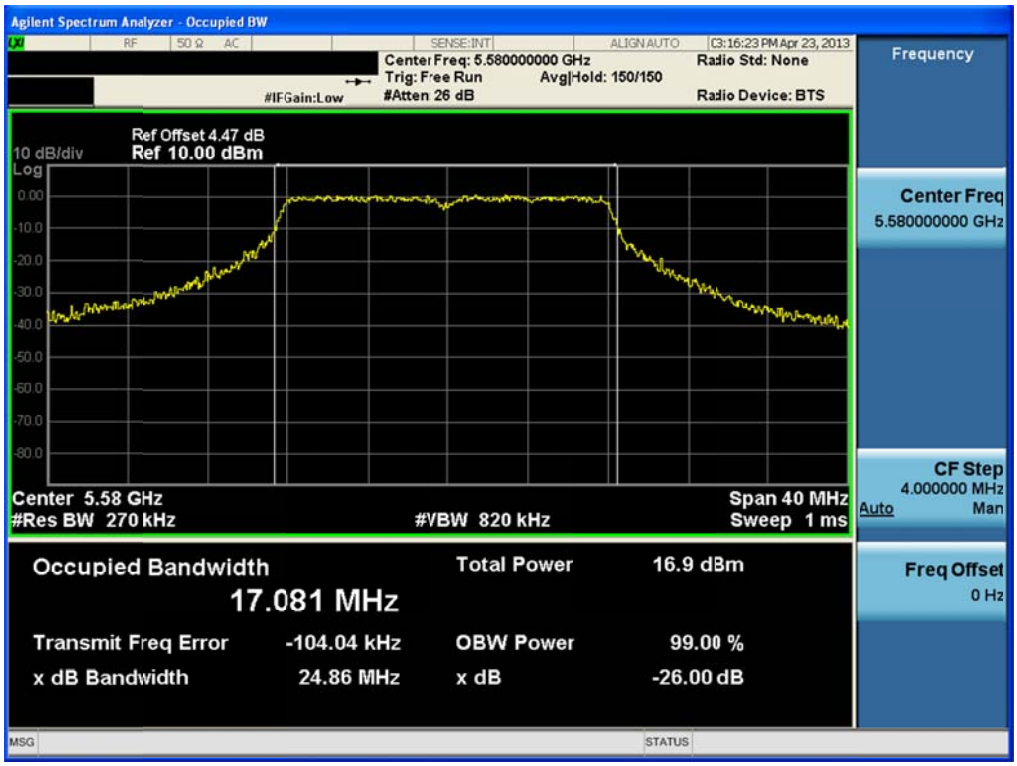
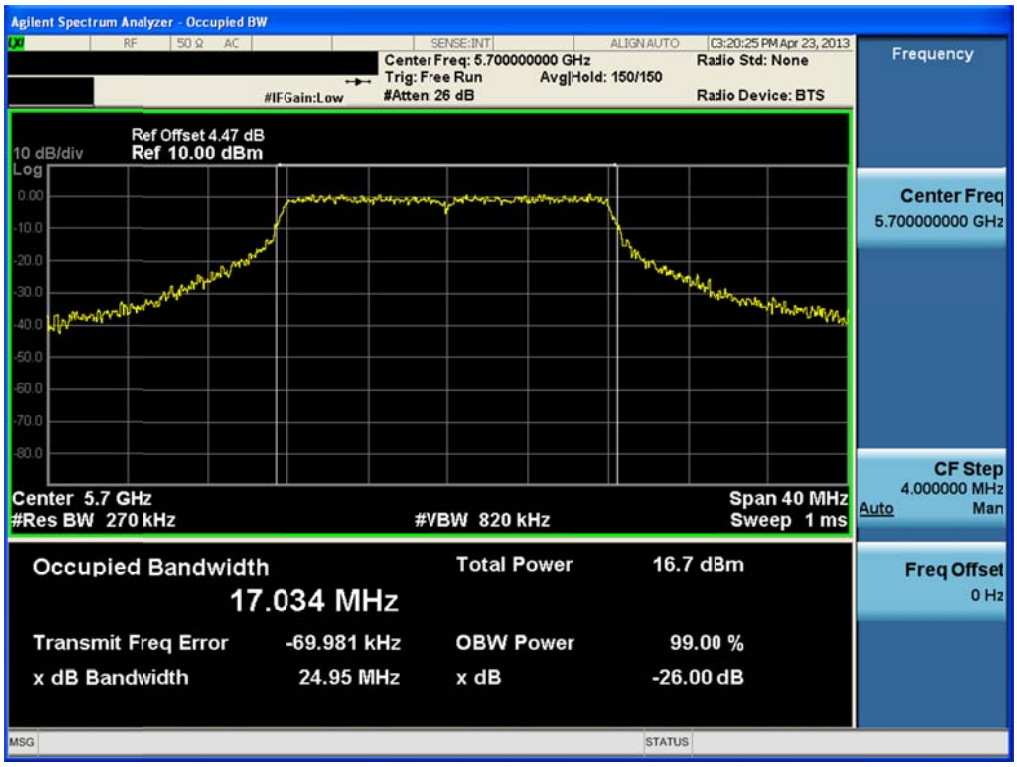


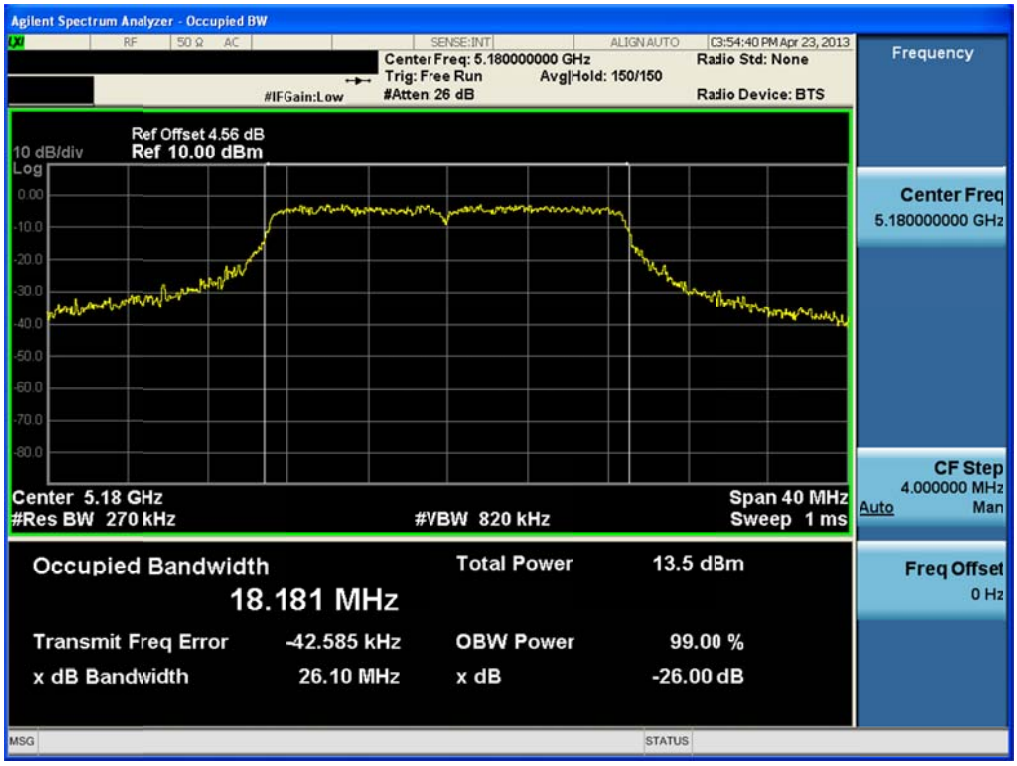
26 dB Bandwidth Test Mode: Chain 0 & 802.11a & Ch.116



26 dB Bandwidth Test Mode: Chain 0 & 802.11a & Ch.140



26 dB Bandwidth Test Mode: Chain 0 & 802.11n-HT20 & Ch.36



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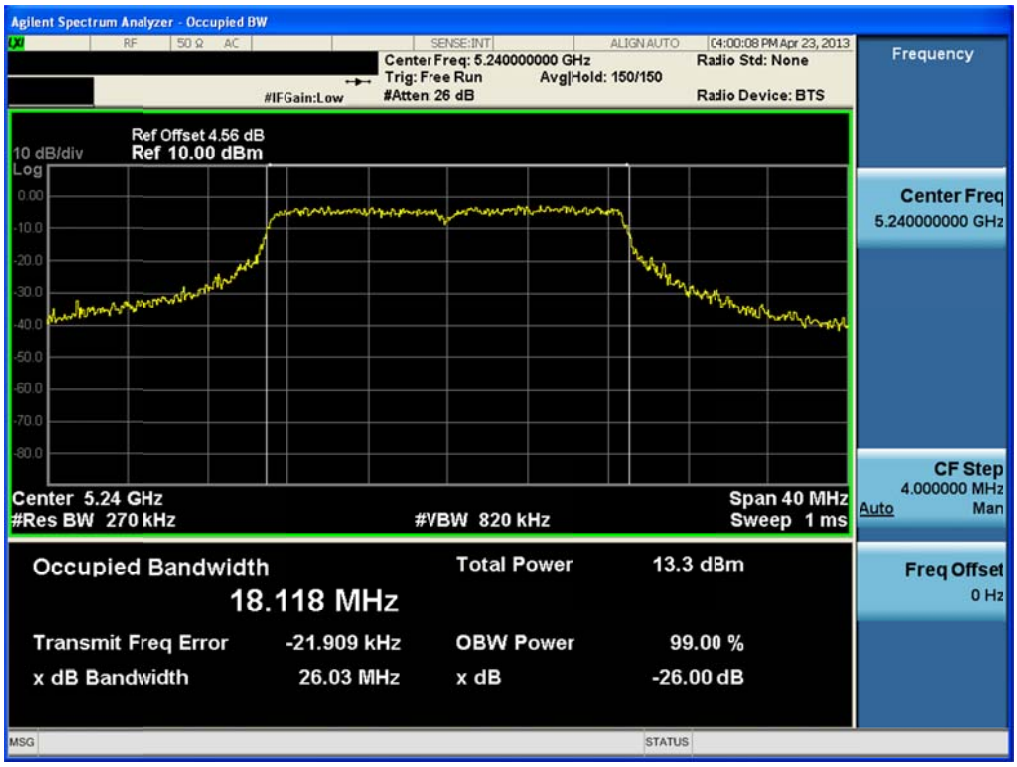
26 dB Bandwidth Test Mode: Chain 0 & 802.11n-HT20 & Ch.48



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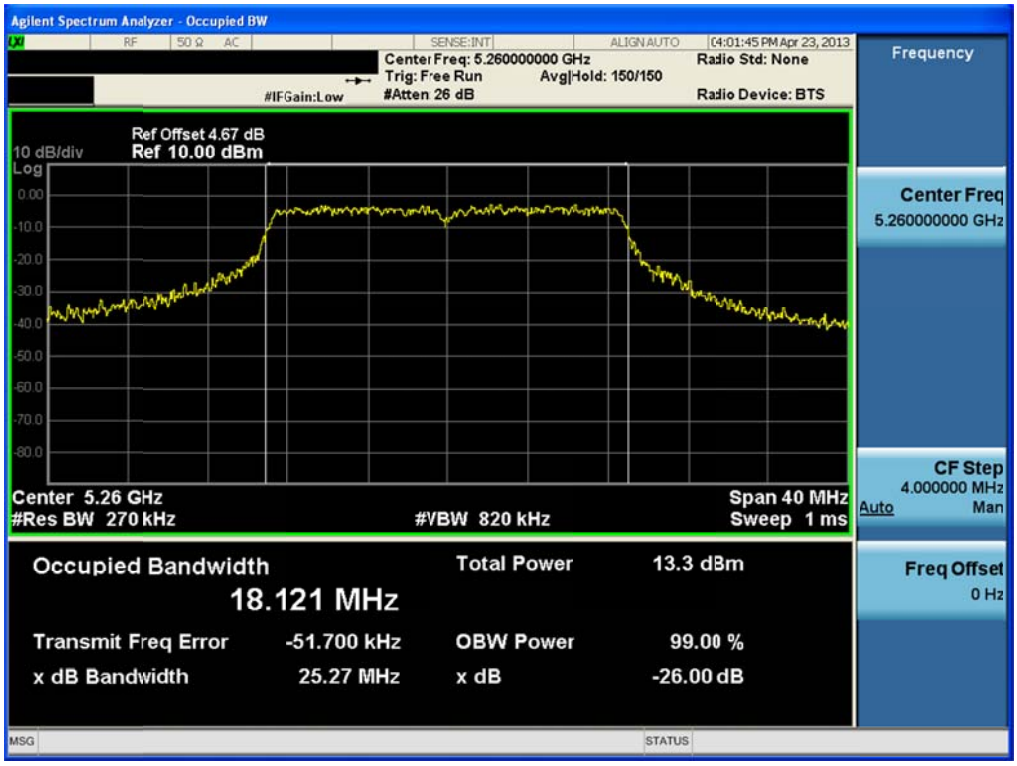

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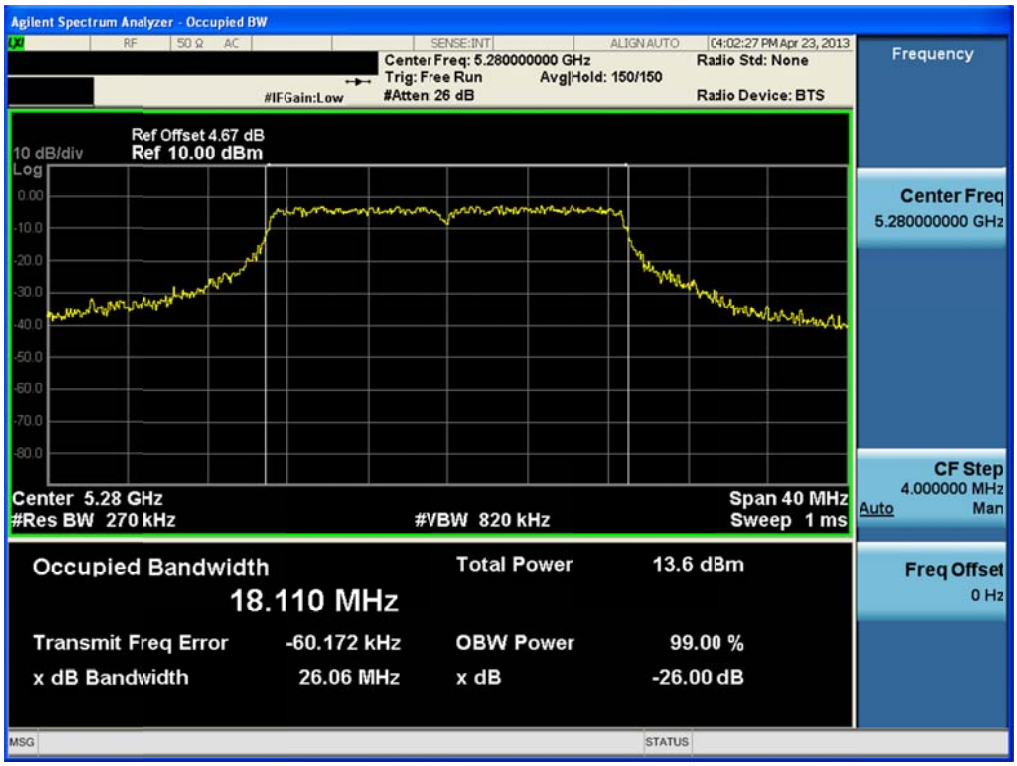

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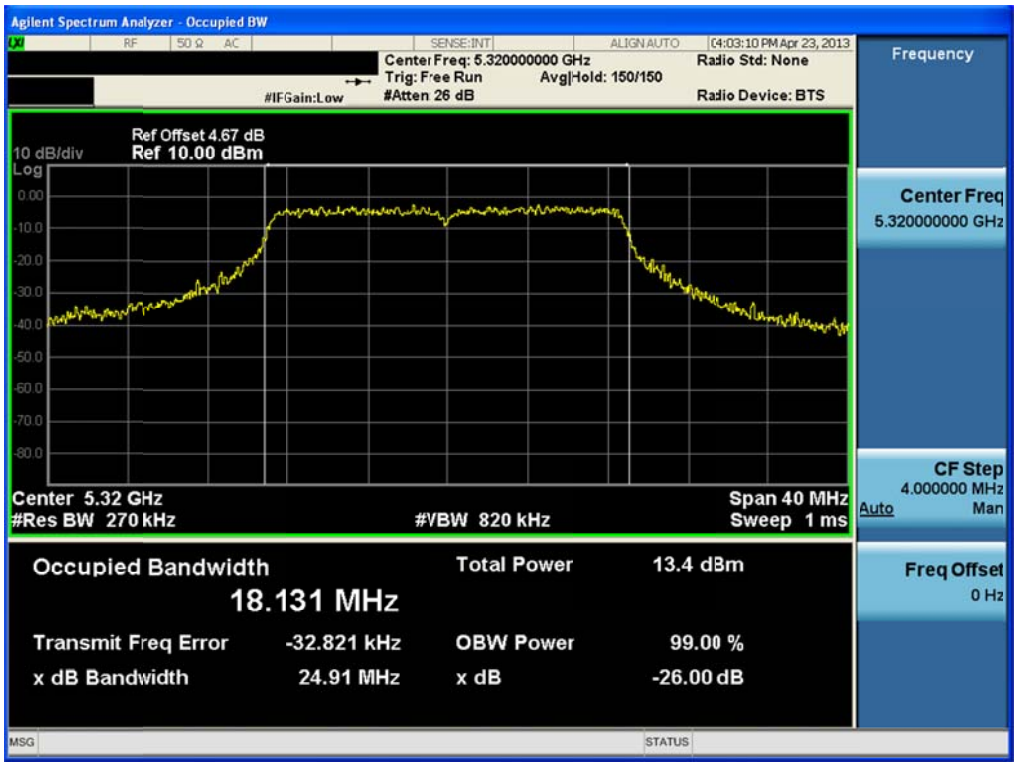

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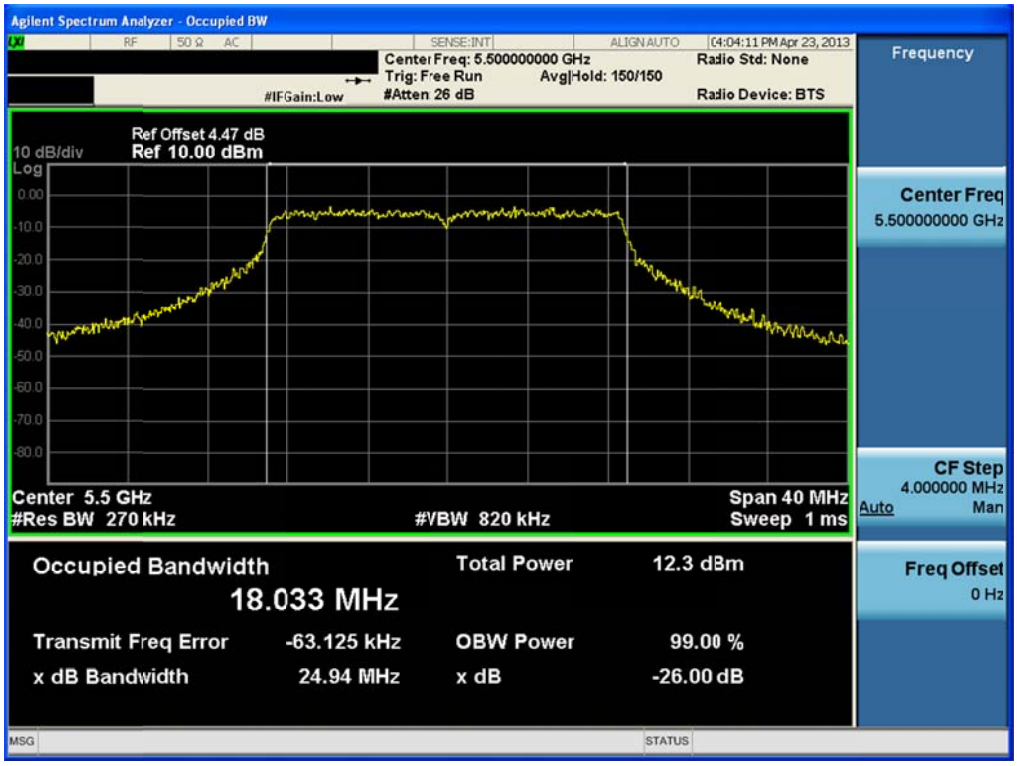

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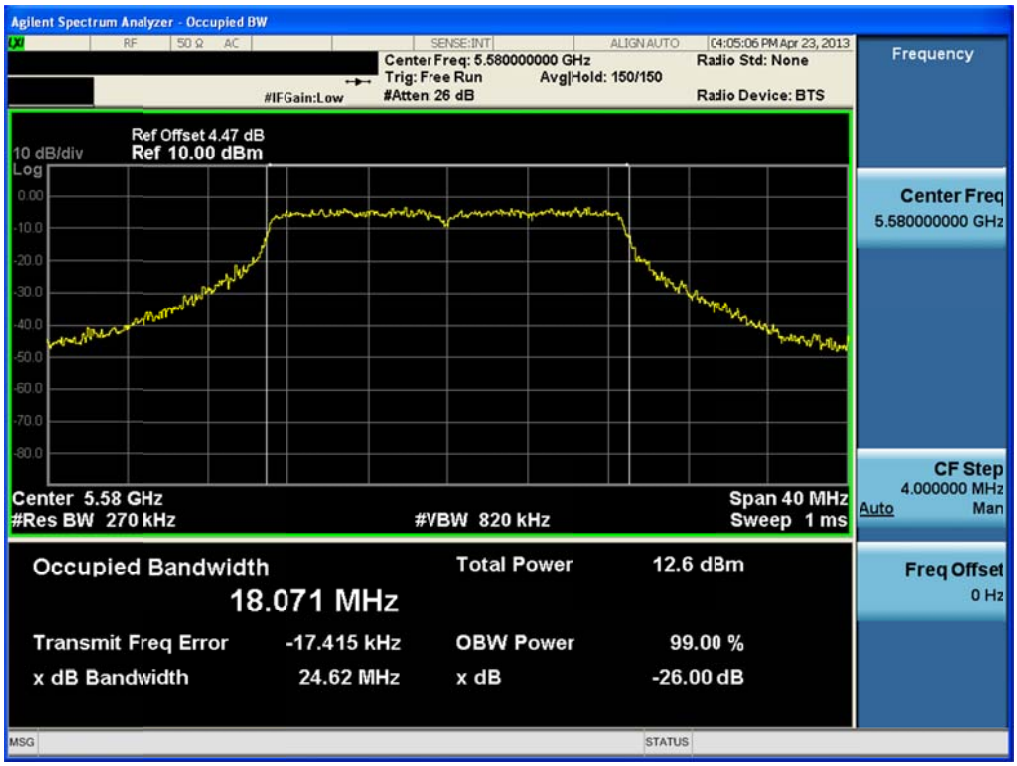

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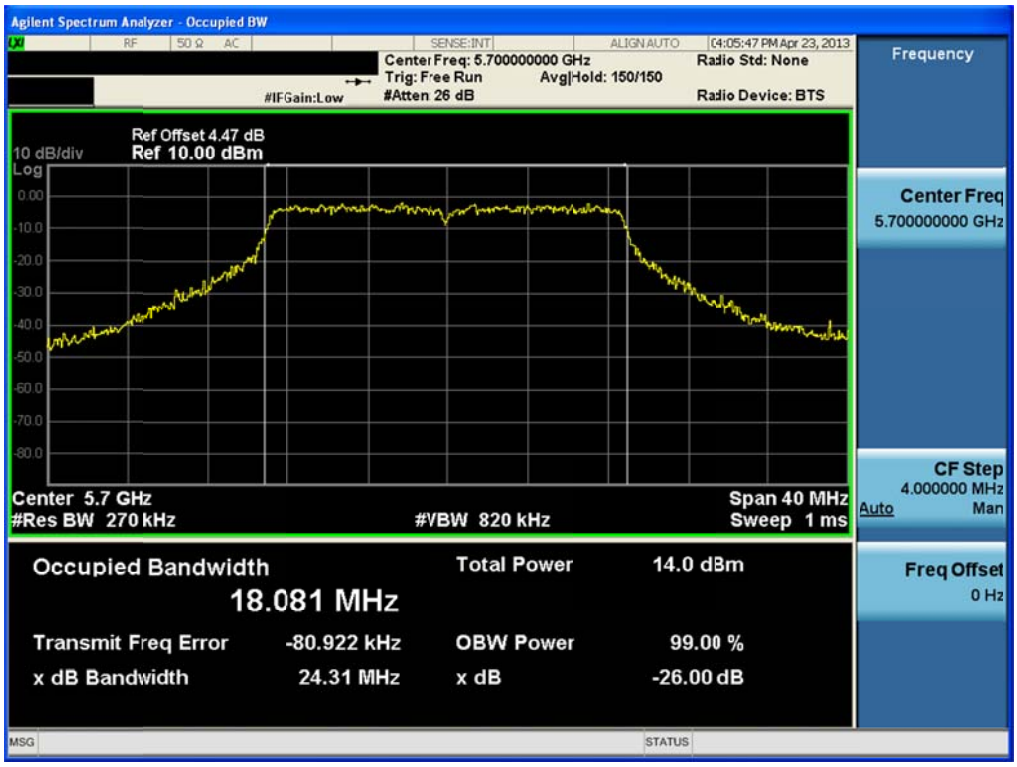

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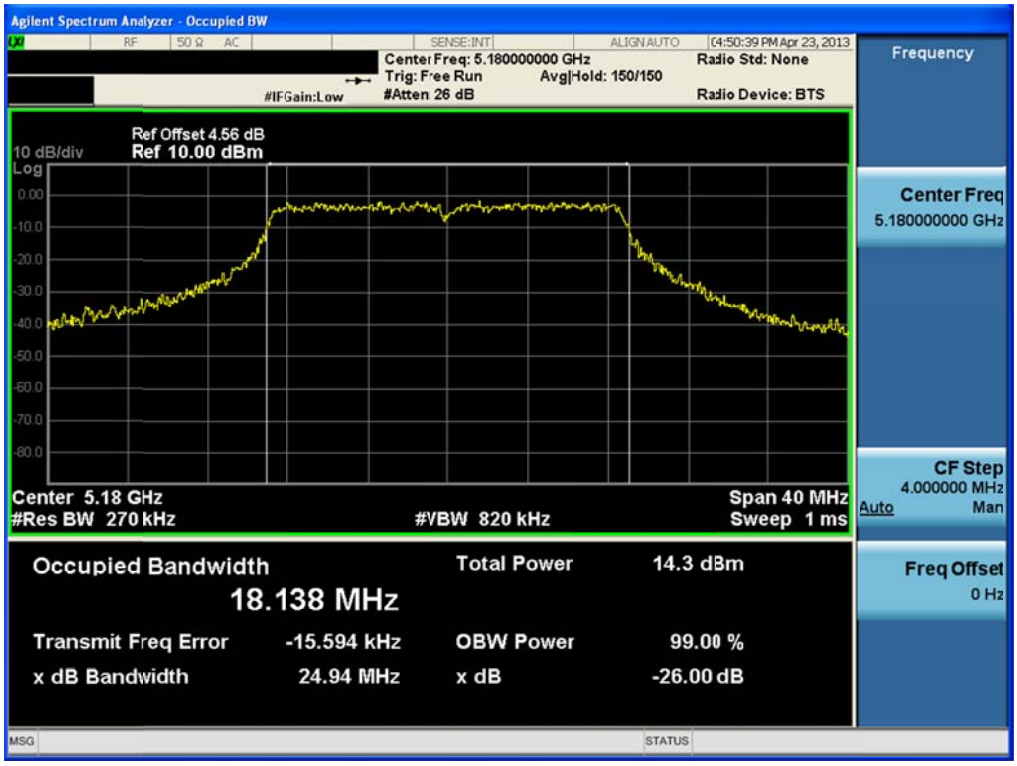

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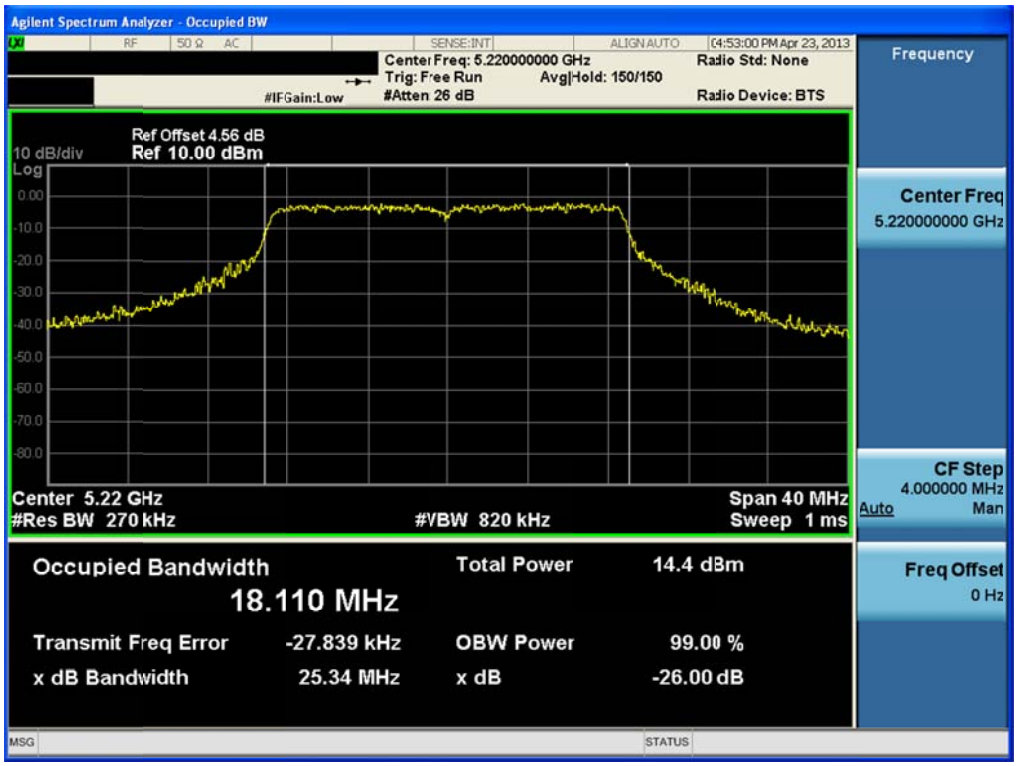

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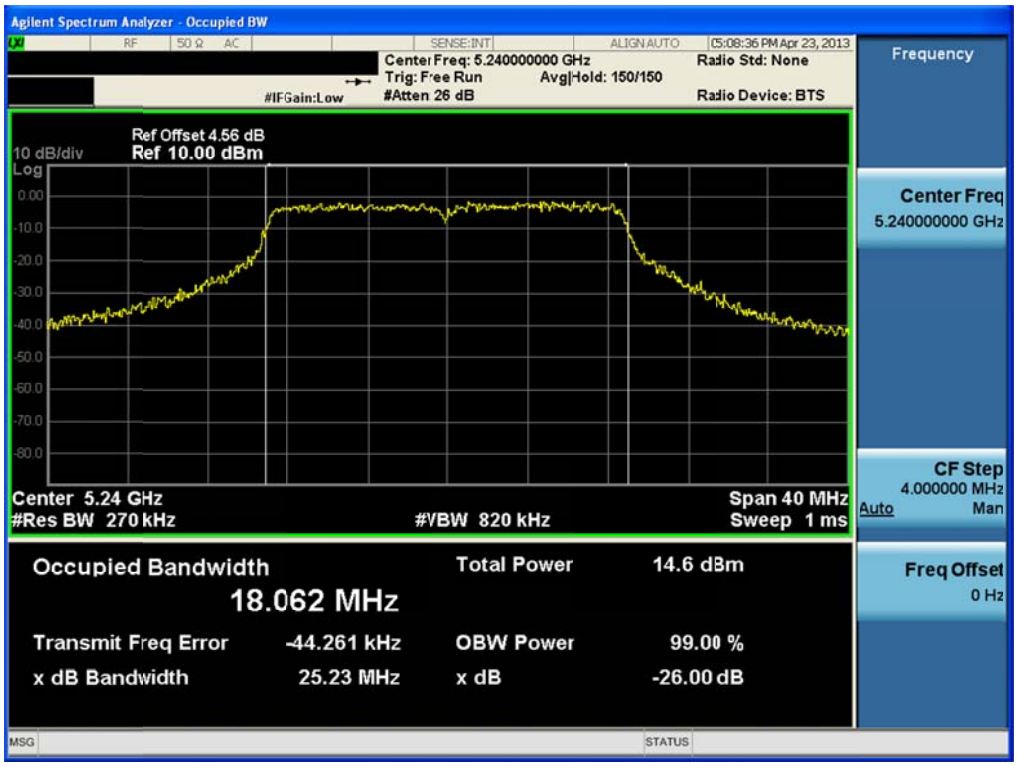

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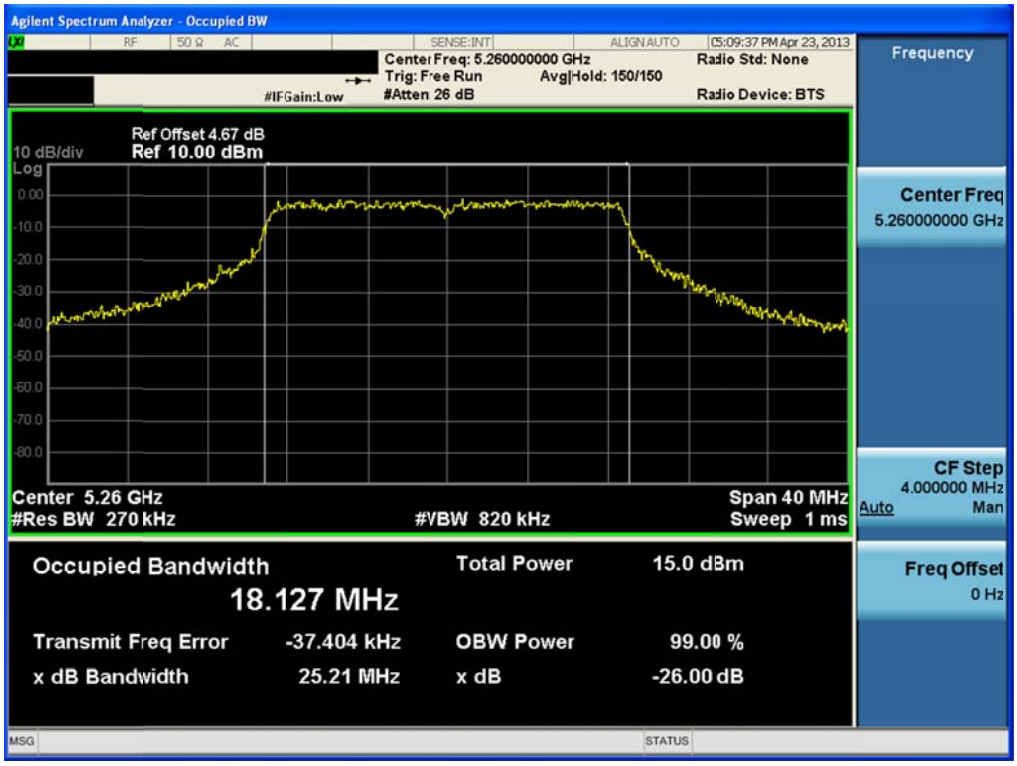

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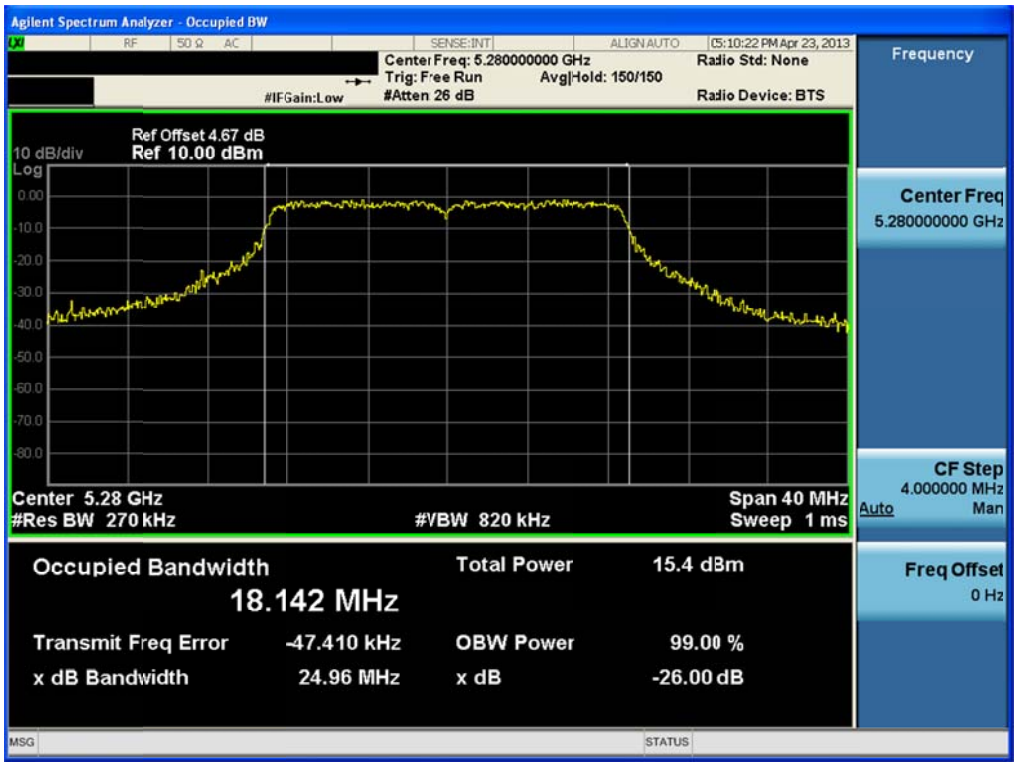

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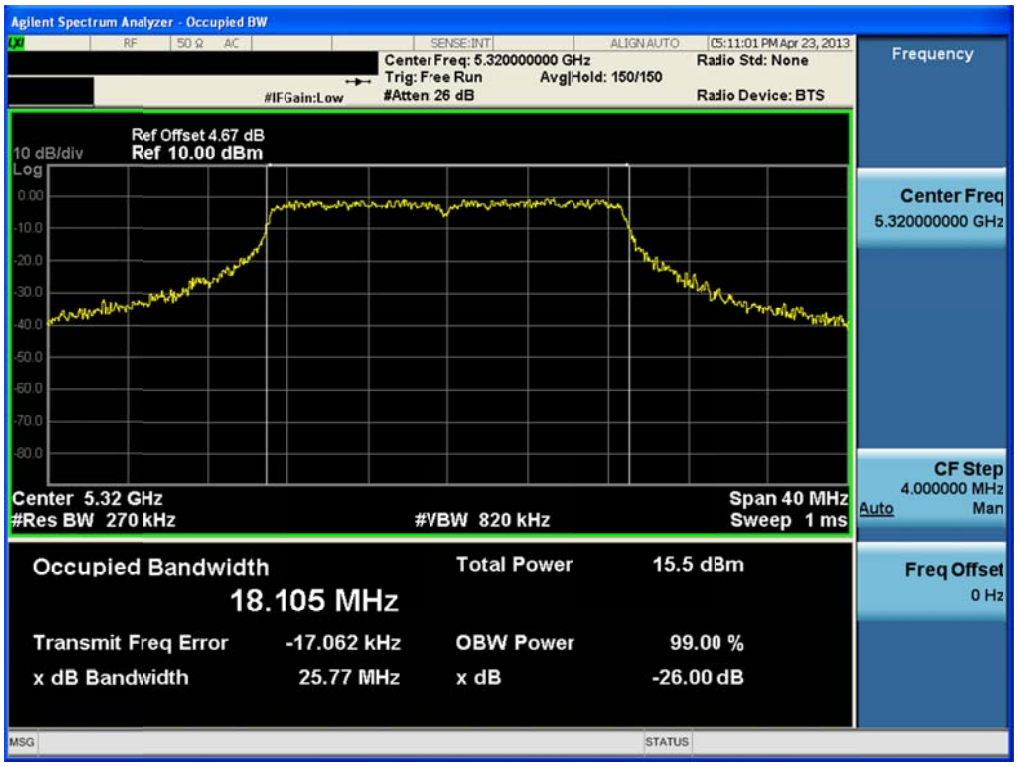

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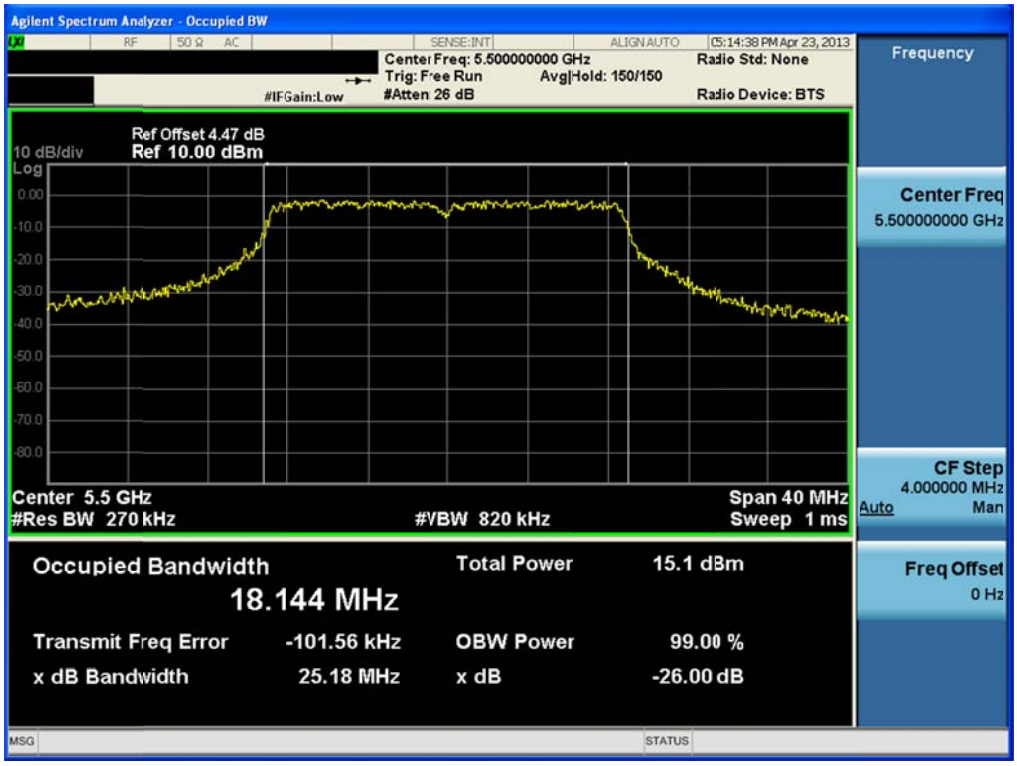

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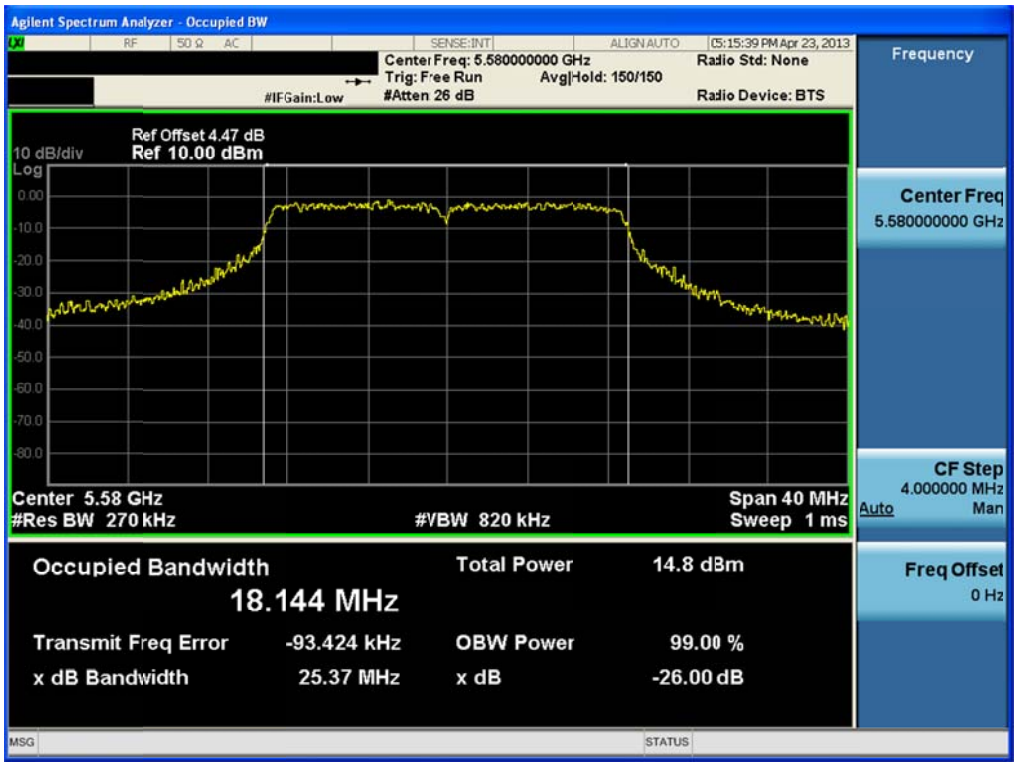

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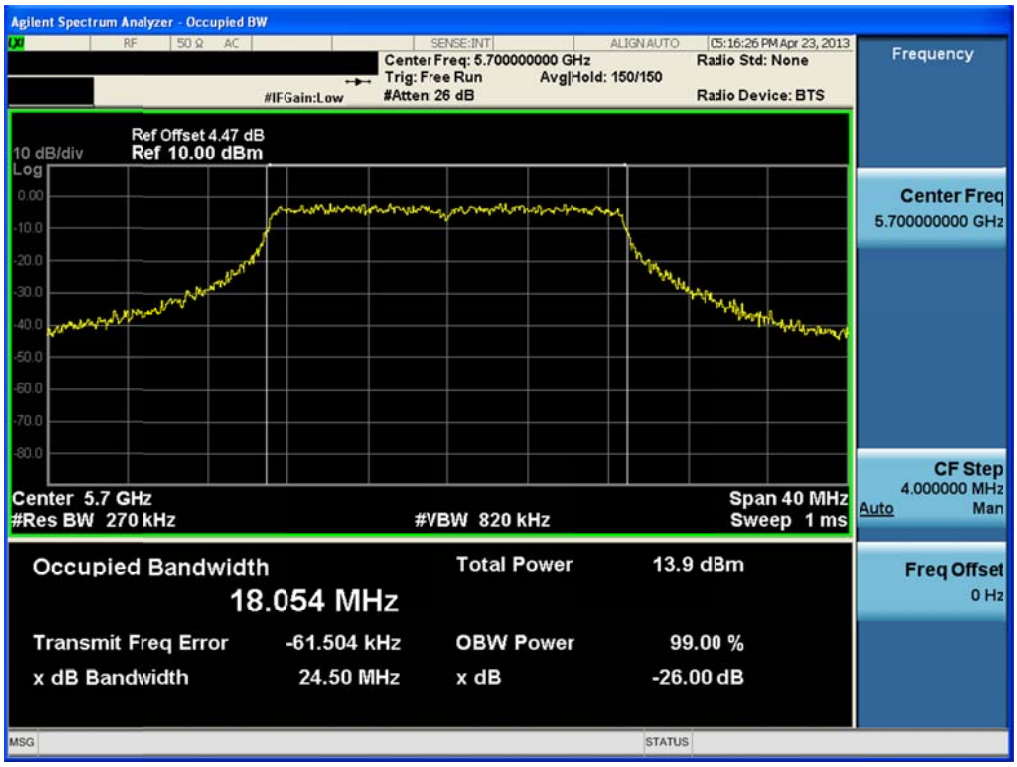

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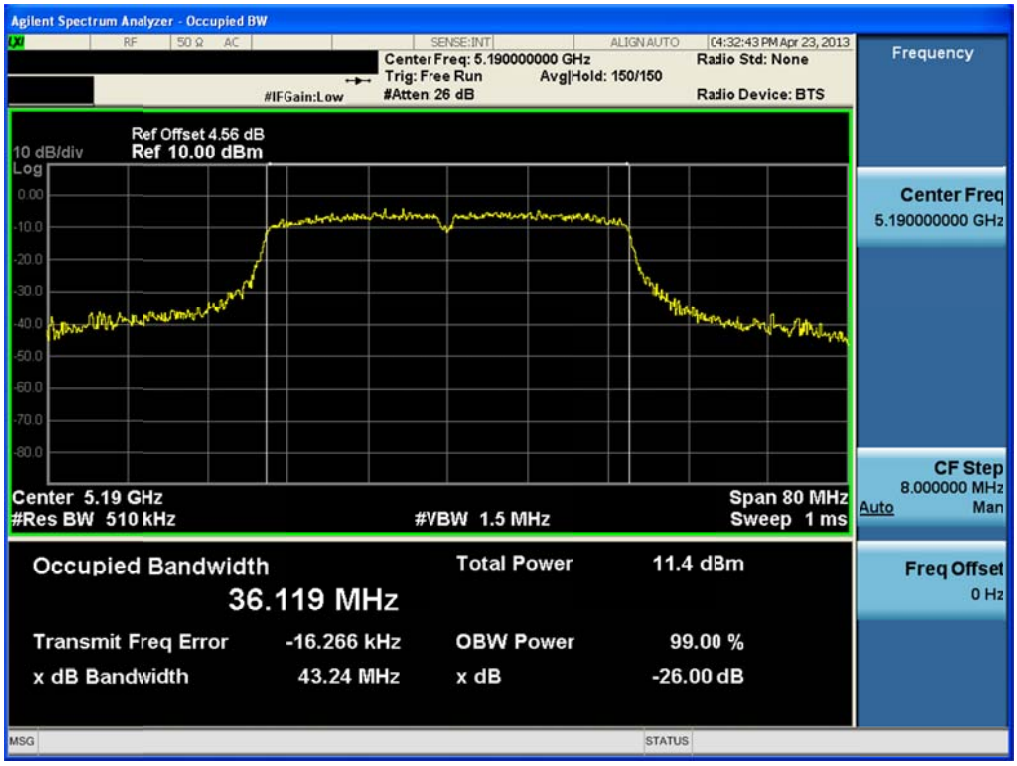

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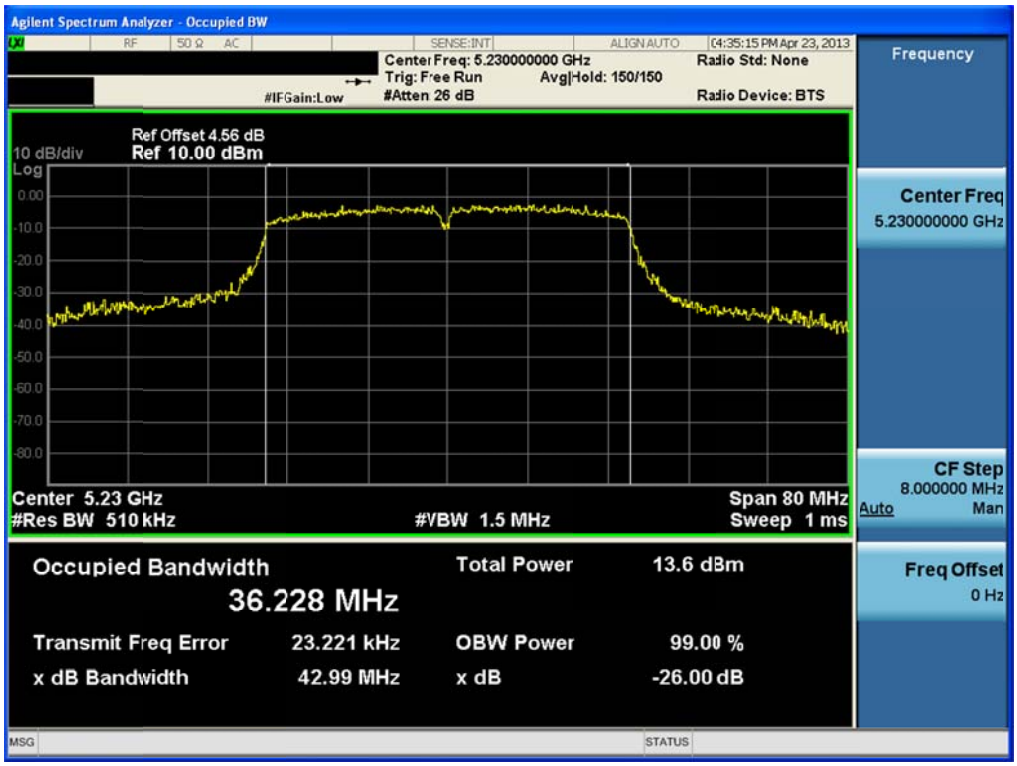

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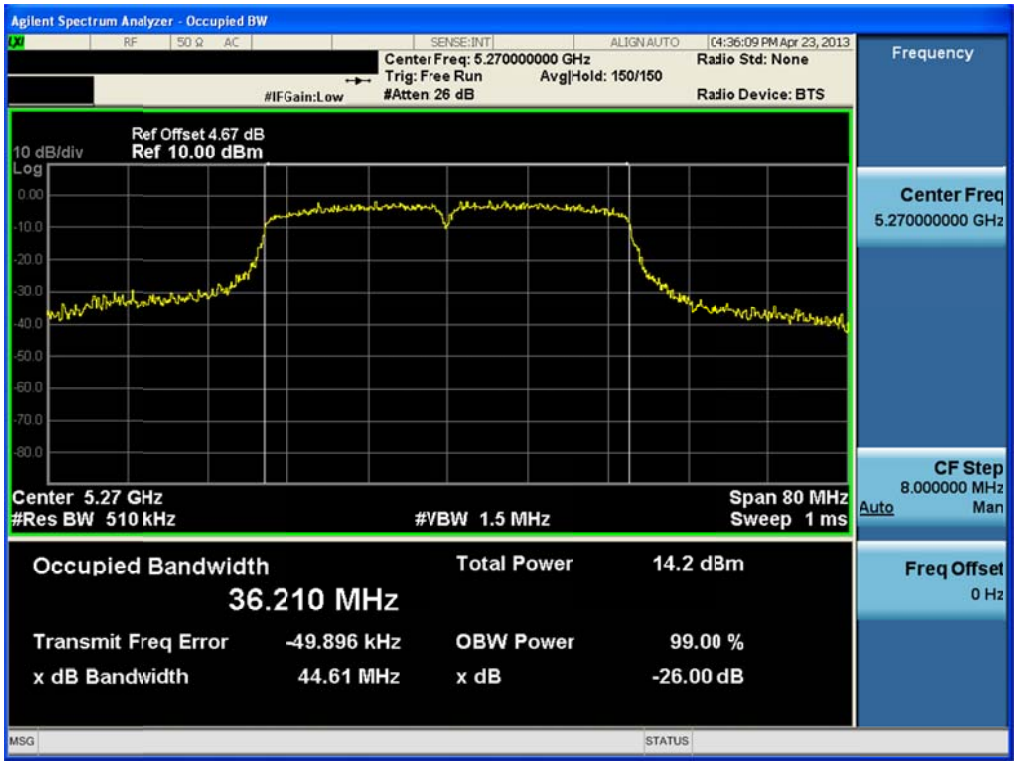

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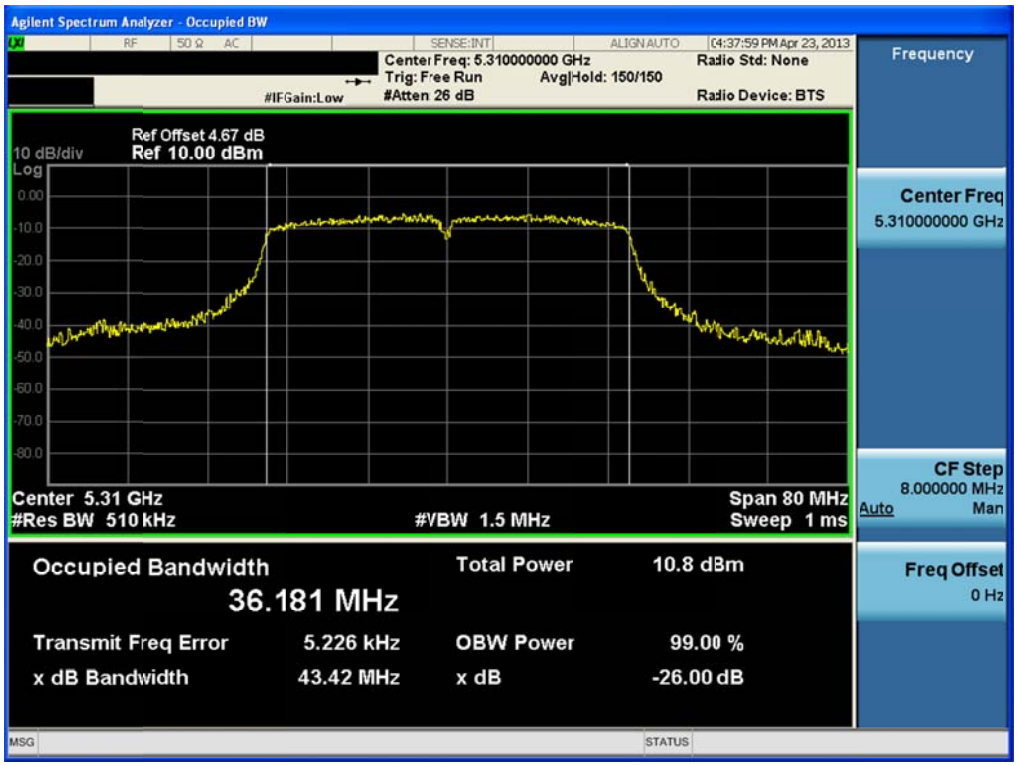

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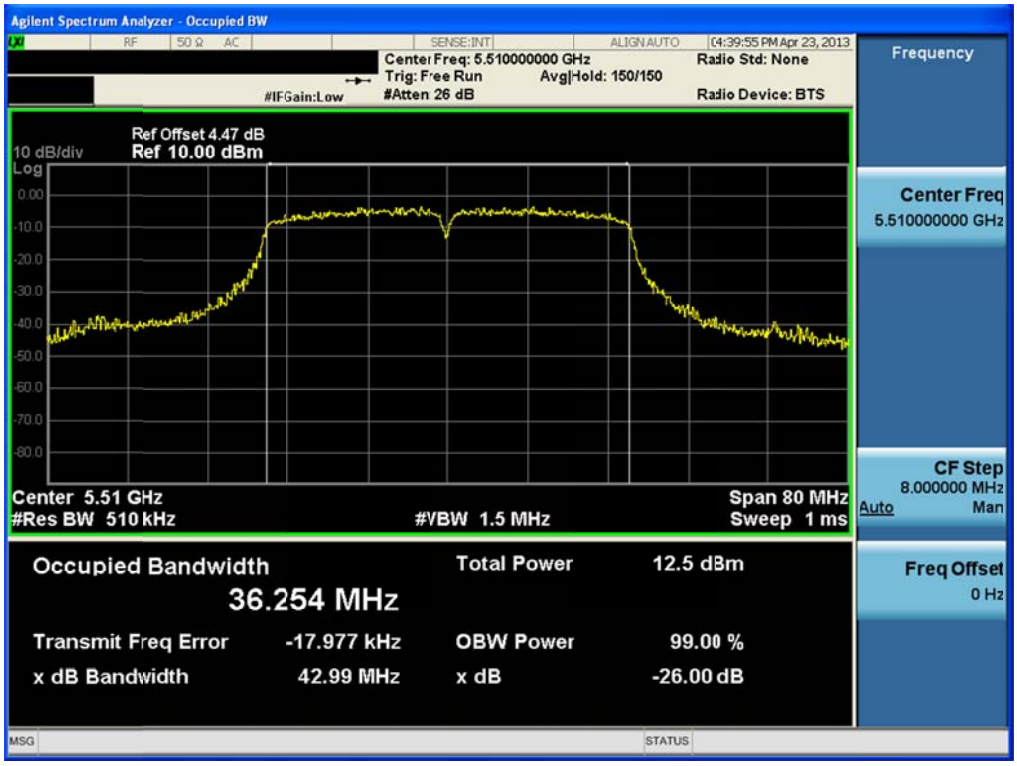

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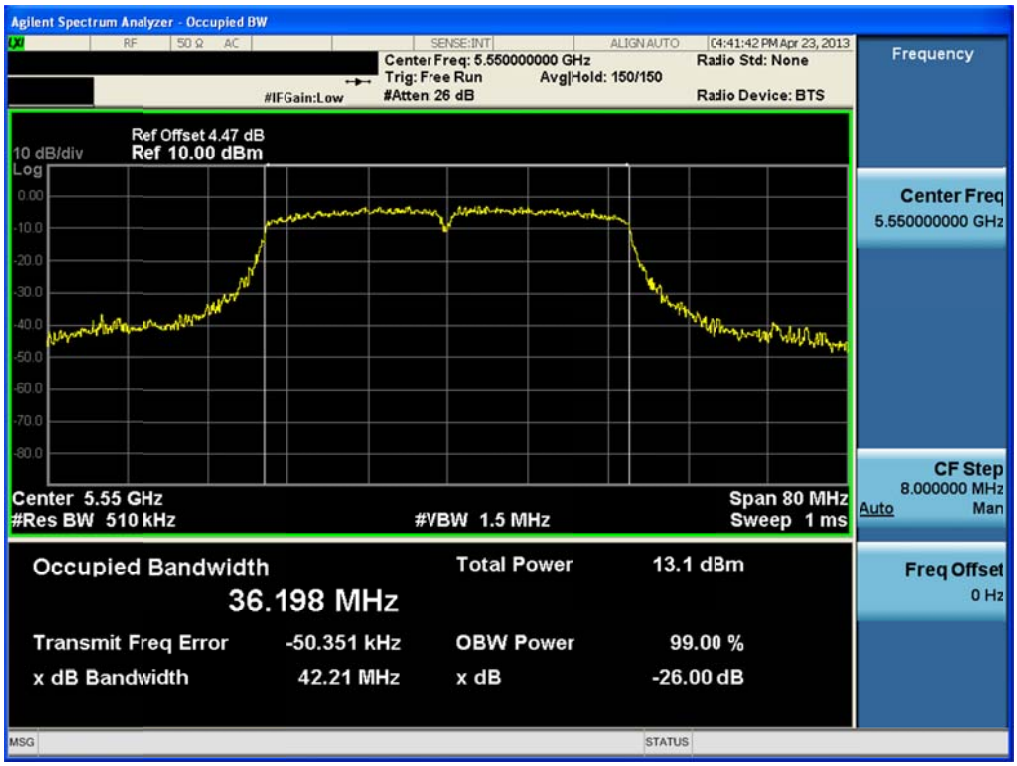

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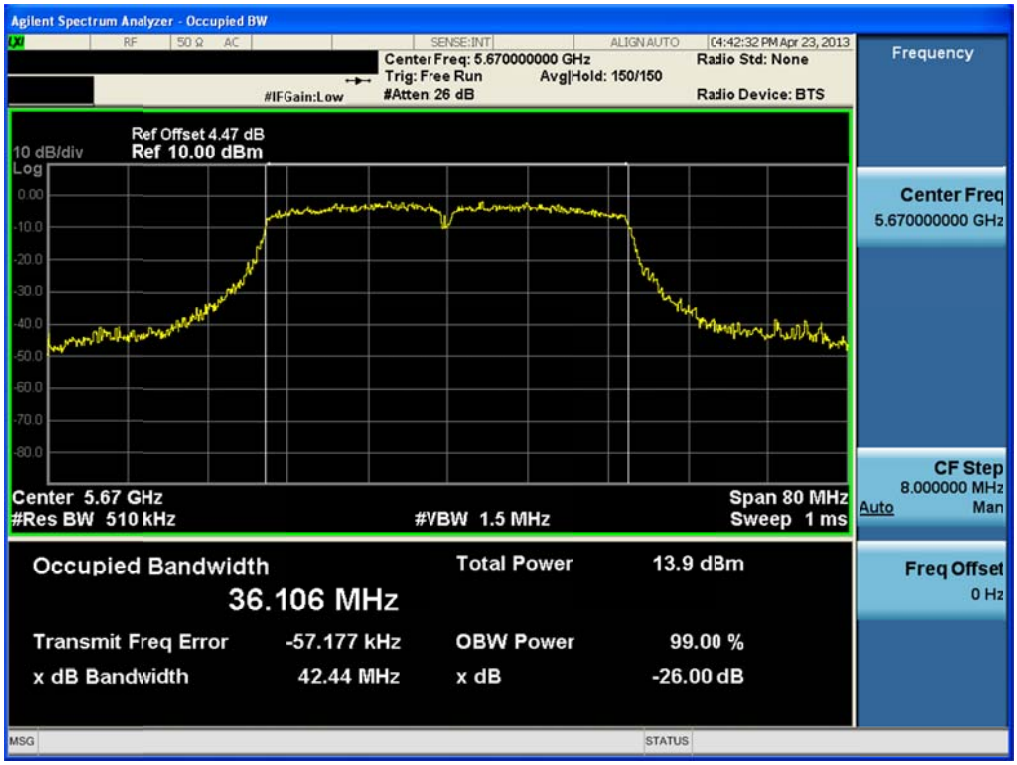

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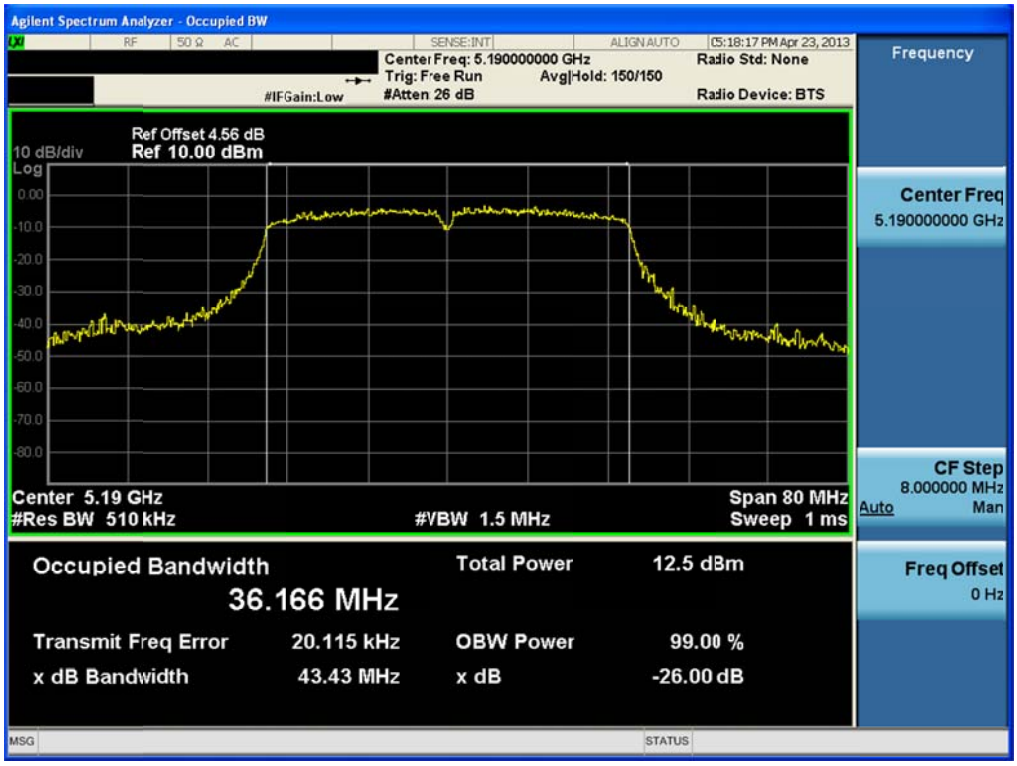

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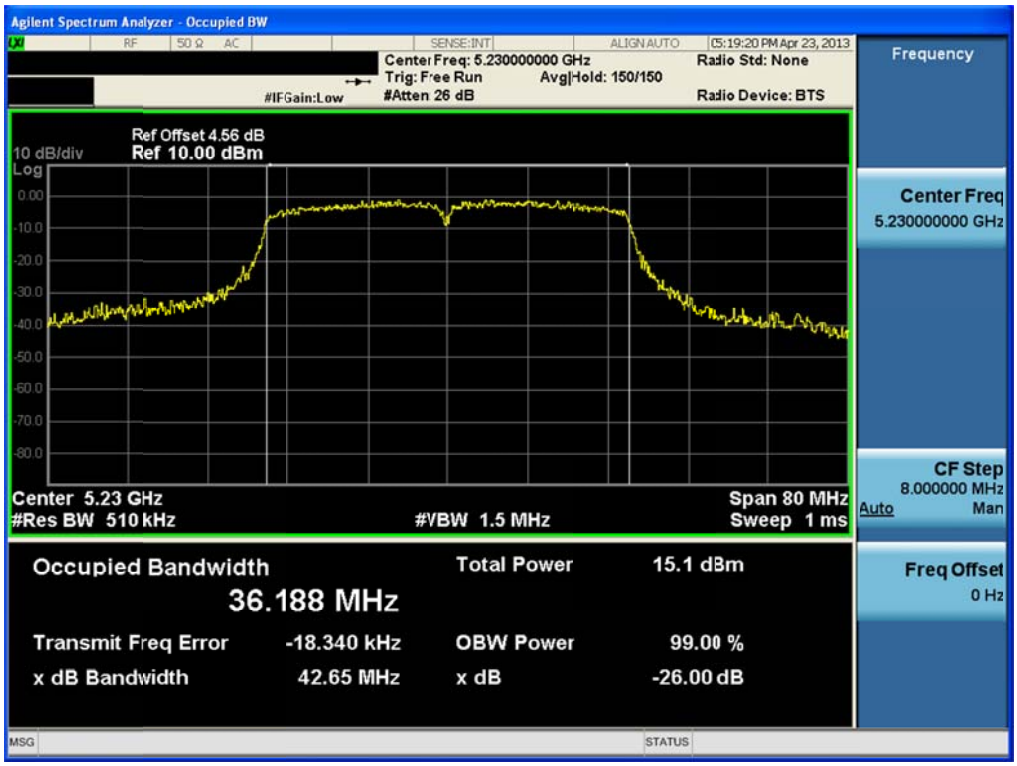

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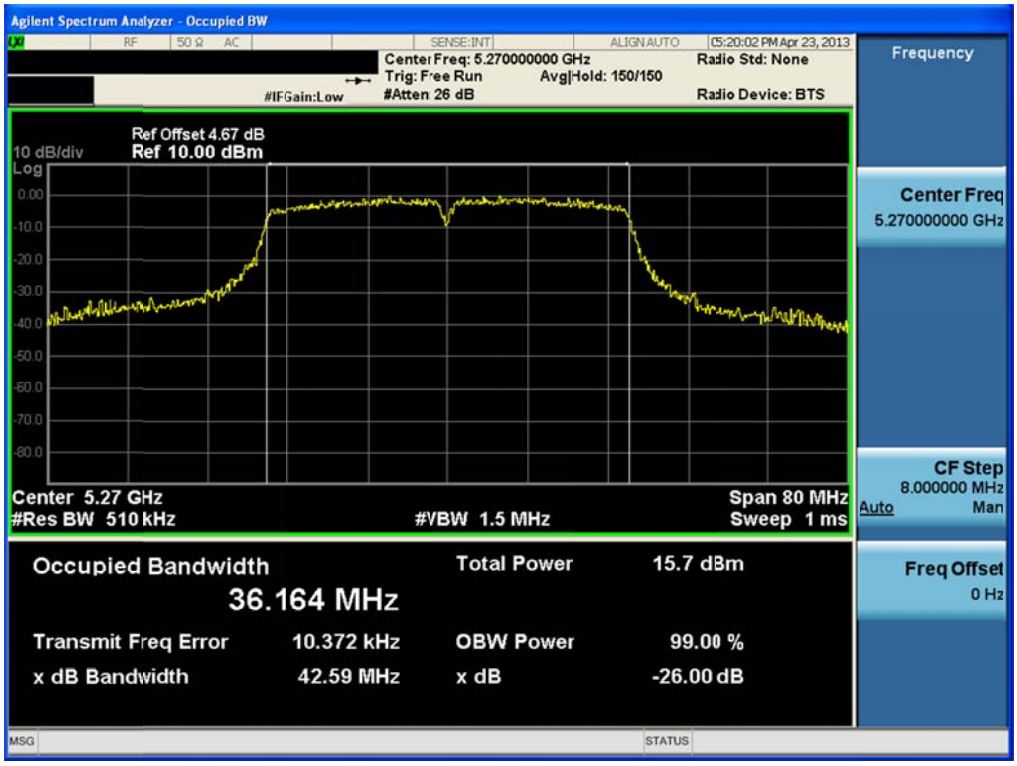
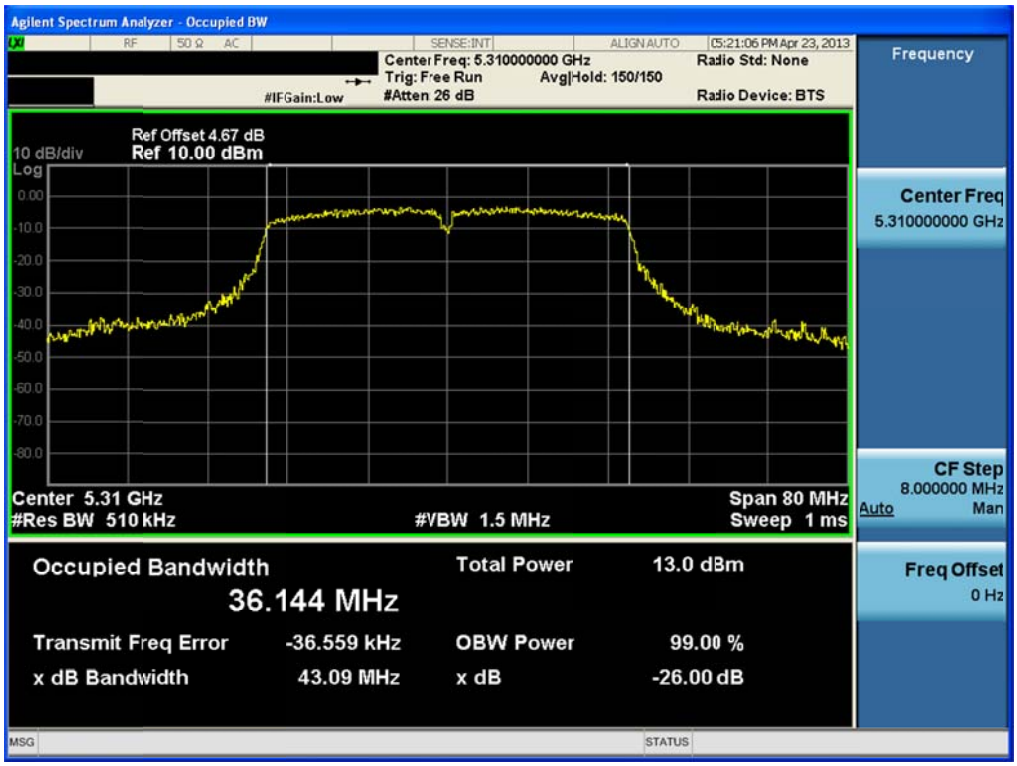
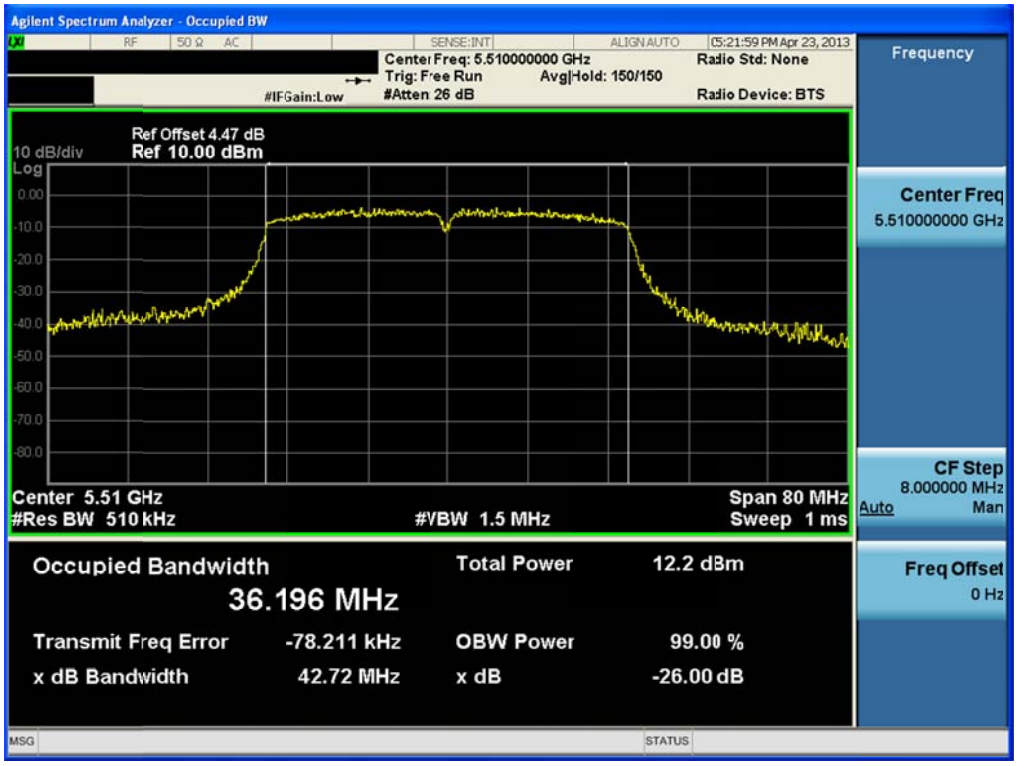


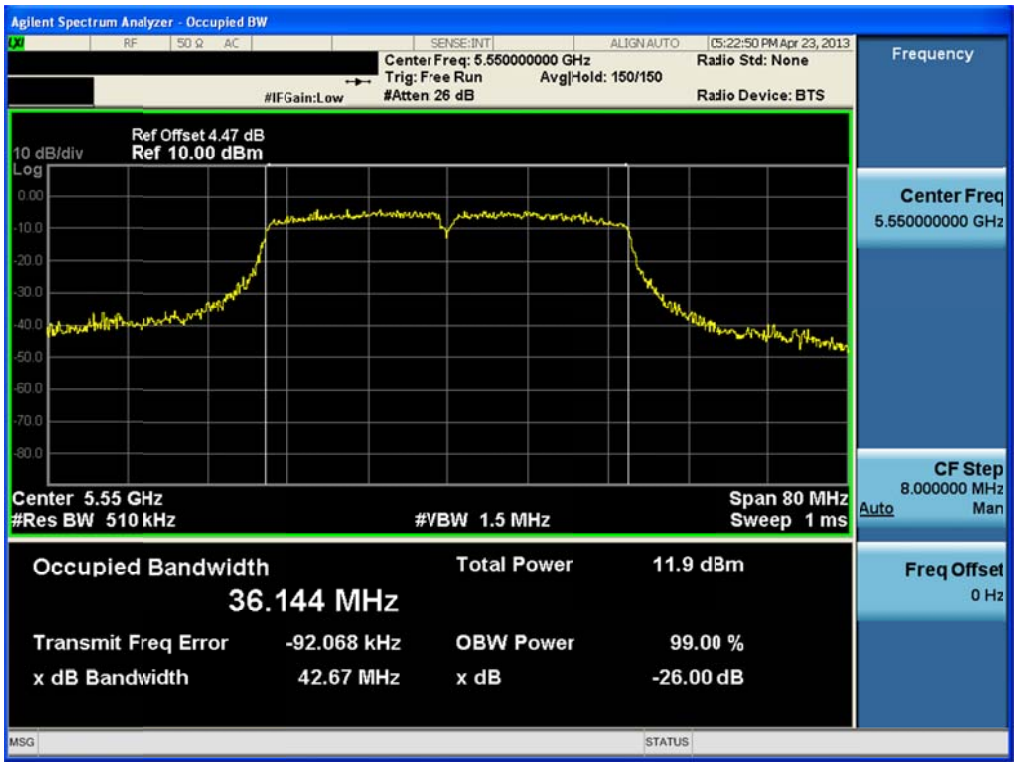
26 dB Bandwidth Test Mode: Chain 1 & 802.11n-HT40 & Ch.62



26 dB Bandwidth Test Mode: Chain 1 & 802.11n-HT40 & Ch.102



26 dB Bandwidth Test Mode: Chain 1 & 802.11n-HT40 & Ch.110



26 dB Bandwidth Test Mode: Chain 1 & 802.11n-HT40 & Ch.134

3.2.2 Maximum Conducted Output Power

▣FCC Test Requirements

(1) For the band 5.15-5.25 GHz, the maximum conducted output power over thefrequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10log B, where B is the 26dB emission bandwidth in MHz.
If transmitting antennas of directional gain greater than 6 dBi are used, both themaximum conducted output power and the peak power spectral density shall be reduced by the amount indB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted outputpower over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10log B,where B is the 26 dB emission bandwidth in megahertz. If transmitting antennas of directional gain greater than 6dBi are used, both the maximum conducted output power and the peak power spectral density shall bereduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

▣IC Test Requirements

(1) For the band 5.15-5.25 GHz, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log10 B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
(2) For the 5.25-5.35 GHz, the maximum conducted output power shall not exceed 250 mW or 11 + 10 log10 B, dBm, whichever power is less.
(3) The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10 B, dBm, whichever power is less.

▣Maximum conductedOutput power Limit Calculation

Bands	Mode	Power Limit [mW]	Calculation Limit [dBm]	ANT Gain			Determined Limit [dBm]
		Least 26dB BW [MHz]		ANT0 [dBi]	ANT1 [dBi]	MIMO Directional Gain [dBi]	
Band I	802.11a	50	16.98	4.22	0.54	N/A	16.98
		25.210	18.01				
	802.11n HT20	50	16.98			5.58	16.98
		24.870	17.95				
	802.11n HT40	50	16.98			5.58	16.98
		42.650	20.29				
Band II	802.11a	250	23.97	1.70	3.13	N/A	23.97
		27.150	25.33				
	802.11n HT20	250	23.97			5.45	23.97
		24.910	24.96				
	802.11n HT40	250	23.97			5.45	23.97
		42.590	27.29				
Band III	802.11a	250	23.97	3.53	3.48	N/A	23.97
		24.860	24.95				
	802.11n HT20	250	23.97			6.52	23.45
		24.310	24.85				
	802.11n HT40	250	23.97			6.52	23.45
		42.210	27.25				

Note 1: The worst limit was used in FCC and IC limits.
Note 2 : Using Correlated Directional Gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2$ /N] dBi

▣TEST CONFIGURATION

Refer to the APPENDIX I.

▣TEST PROCEDURE:

MaximumConducted Output Power is measured using Measurement Procedure **Method SA-2 of KDB789033**

1. Set the **RBW = 1 MHz&VBW ≥ 3 MHz**.
2. Set span to encompass the **26 dB EBW** (or, alternatively, the entire 99% occupied bandwidth) of the signal.
3. Detector = **RMS (power averaging)**
4. Sweep time = **auto couple**.
5. **Trace average at least 100 traces in power averaging**.
6. **Compute power by integrating the spectrum across the 26 dB EBW** (or, alternatively, the entire99% occupied bandwidth) ofthe signal using the instrument's band power measurement functionwith band limits set equal to the EBW (or occupied bandwidth) band edges.
7. **Add 10 log(1/x), where x is the duty cycle**, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission)

▣TEST RESULTS :Comply

Mode	CH	Freq. [MHz]	Reading [dBm]	Duty Cycle (x)	DCF [dB]	Test Result			
						Chain 0		Chain 1	
						[dBm]	[W]	[dBm]	[W]
802.11a	36	5180	8.56	0.97	0.14	8.70	0.007	-	-
	44	5220	10.21			10.35	0.011	-	-
	48	5240	10.42			10.56	0.011	-	-
	52	5260	10.53			10.67	0.012	-	-
	56	5280	10.63			10.77	0.012	-	-
	64	5320	10.69			10.83	0.012	-	-
	100	5500	9.66			9.80	0.010	-	-
	116	5580	9.77			9.91	0.010	-	-
	140	5700	9.78			9.92	0.010	-	-

Mode	CH	Freq. [MHz]	Reading [dBm]		Duty Cycle (x)	DCF [dB]	Test Result			
			Chain 0 [dBm]	Chain 1 [dBm]			Chain0 [dBm]	Chain1 [dBm]	Aggregate Power Note2	
									[dBm]	[W]
802.11n HT20	36	5180	6.52	7.78	0.94	0.27	6.79	8.05	10.48	0.011
	44	5220	6.33	7.61			6.60	7.88	10.30	0.011
	48	5240	6.42	7.98			6.69	8.25	10.55	0.011
	52	5260	6.57	8.16			6.84	8.43	10.72	0.012
	56	5280	6.44	8.26			6.71	8.53	10.72	0.012
	64	5320	6.79	8.74			7.06	9.01	11.15	0.013
	100	5500	5.62	7.97			5.89	8.24	10.23	0.011
	116	5580	5.75	7.87			6.02	8.14	10.22	0.011
	140	5700	7.60	7.13			7.87	7.40	10.65	0.012
802.11n HT40	38	5190	4.11	5.57	0.93	0.32	4.43	5.89	8.23	0.007
	46	5230	6.56	8.09			6.88	8.41	10.72	0.012
	54	5270	6.72	8.70			7.04	9.02	11.15	0.013
	62	5310	3.84	6.03			4.16	6.35	8.40	0.007
	102	5510	5.81	8.25			6.13	8.57	10.53	0.011
	110	5550	6.40	8.01			6.72	8.33	10.61	0.012
	134	5670	6.97	6.76			7.29	7.08	10.20	0.010

Note 1 :Duty cycle(x) = On time / (On + Off time), For On time and On time information, please refer to APPENDIX II.
DCF = 10 * log (1 / x)
Test Result = Reading + DCF

Note 2: Aggregate power = $10\log(10^{(\frac{\text{chain 0}}{10})} + 10^{(\frac{\text{chain 1}}{10})})$

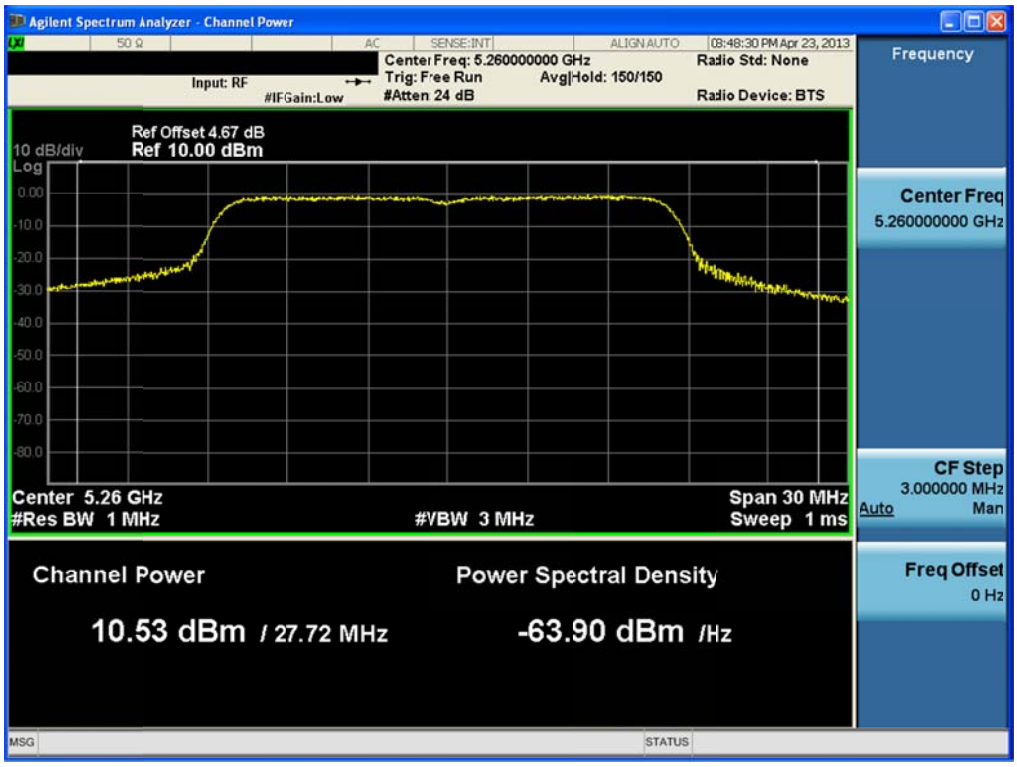
▣Measurement Data PLOTS

Output Power Test Mode: Chain 0 & 802.11a & Ch.36

Output Power Test Mode: Chain 0 & 802.11a & Ch.44

Output Power Test Mode: Chain 0 & 802.11a & Ch.48

Output Power Test Mode: Chain 0 & 802.11a &Ch.52



Output Power Test Mode: Chain 0 & 802.11a & Ch.56

Output Power Test Mode: Chain 0 & 802.11a & Ch.64

Output Power Test Mode: Chain 0 & 802.11a & Ch. 100

Output Power Test Mode: Chain 0 & 802.11a & Ch. 116

Output Power Test Mode: Chain 0 & 802.11a & Ch.140

Output Power Test Mode: Chain 0 & 802.11n HT20 & Ch.36

Output Power Test Mode: Chain 0 & 802.11n HT20 & Ch.44

Output Power Test Mode: Chain 0 & 802.11n HT20 & Ch.48